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TM 9-231A/TO 39A-5-2

20-mm
AUTOMATIC GUN
T160 AND CAL. .60
AUTOMATIC GUN
T130



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DEPARTMENTS OF THE ARMY
AND THE AIR FORCE
WASHINGTON 25, D. C., 19 September 1952

TM 9-231A/TO 39A-5-2 is published for the information and guidance of all concerned.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual is published for the information and guidance of personnel to whom this matériel is issued, and also personnel responsible for performing field maintenance. It contains information on the operation, organizational and field maintenance as well as ammunition, shipment and limited storage, and destruction of the matériel to prevent enemy use. It also contains a description of major units and their function in relation to other components of the matériel. It applies only to the 20-mm automatic gun T160 and the cal. .60 automatic gun T130 (figs. 1, 2, 3, and 4).

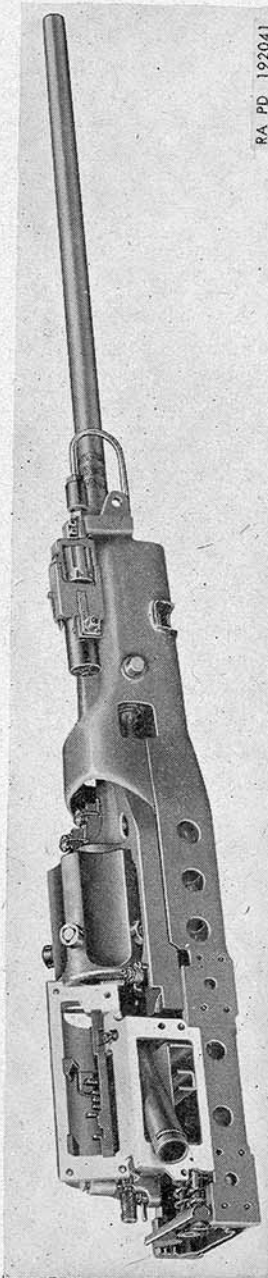
b. The publication of these field maintenance instructions is not to be construed as authority for the performance by organizational maintenance personnel of those functions which have been restricted to field maintenance shops. In general, the prescribed maintenance responsibilities will apply as reflected in the allocation of maintenance parts listed in the current ORD 7 and in the appropriate columns of the current ORD 8 supply catalogs pertaining to these guns. Instructions for field maintenance are to be used by organizational maintenance personnel only when the tactical situation makes the repair function imperative.

c. The appendix contains a list of current references, including supply catalogs, technical manuals, and other available publications applicable to the matériel.

d. This first edition is being published in advance of complete technical review of all concerned. Any errors or omissions will be brought to the attention of Chief of Ordnance, Washington 25, D. C. ATTN: ORDFM-Pub.

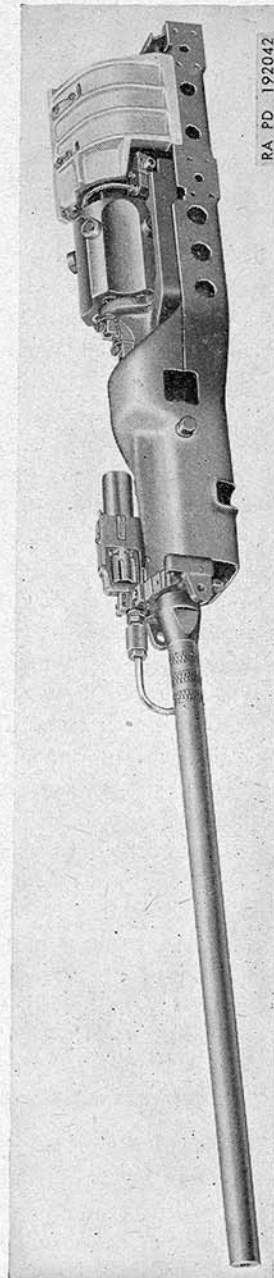
2. Forms, Records, and Reports

a. *Field Report of Accidents.* When an accident involving the use of ammunition occurs during practice, the accident will be reported as prescribed in SR 385-310-1/AFR 50-13 by the ordnance officer under whose supervision the ammunition is maintained or issued. Where practicable, reports covering malfunctions of ammunition in



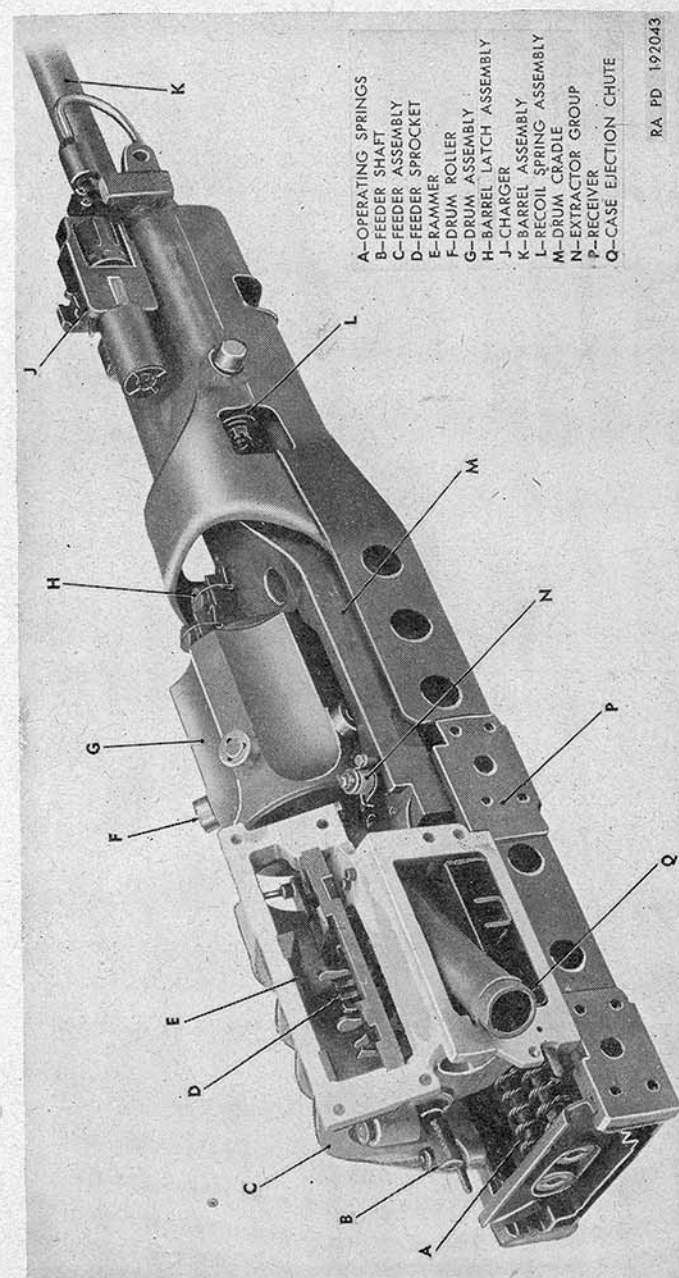
RA PD 192041

Figure 1. 20-mm automatic gun T160 and cal. .60 automatic gun T130—right-side view.



RA PD 192042

Figure 2. 20-mm automatic gun T160 and cal. .60 automatic gun T130—left-side view.



RA PD 192043

Figure 3. 20-mm automatic gun T160 and cal. .60 automatic gun T130.

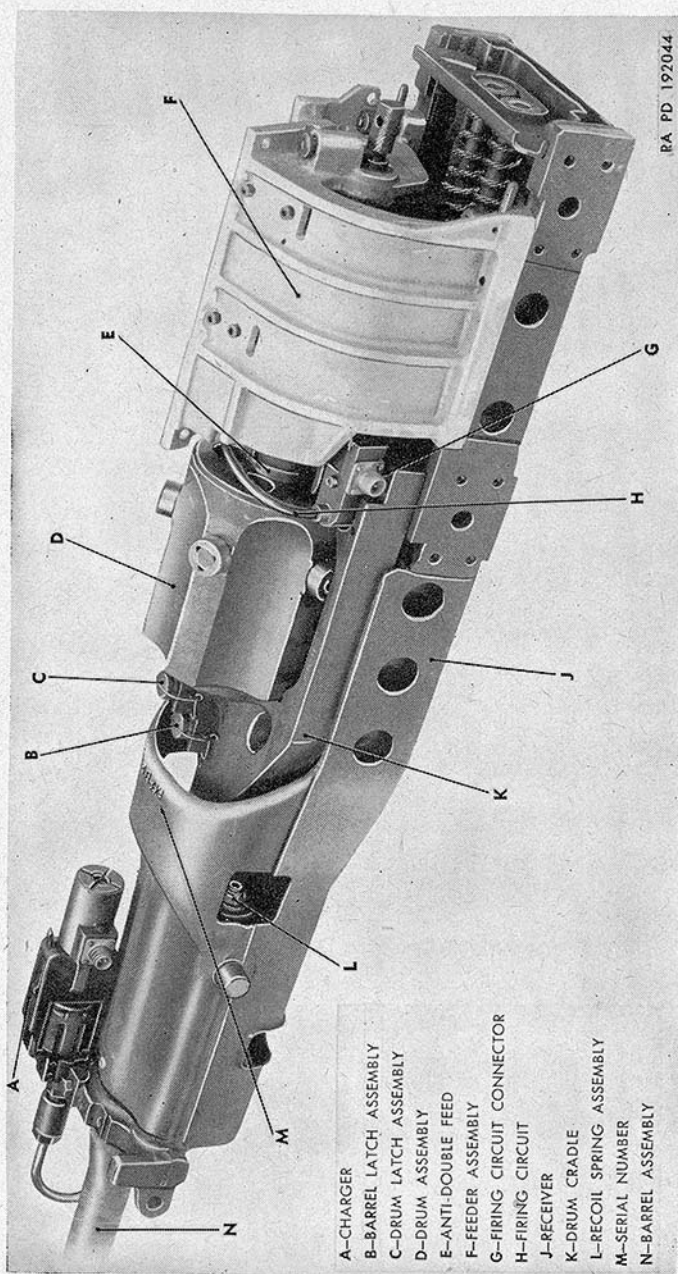


Figure 4. 20-mm automatic gun T160 and cal. .60 automatic gun T130.

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combat will be made to the Chief of Ordnance, Washington 25, D. C., ATTN: ORDFM, through channels, giving the type of malfunction, the type of ammunition, the lot number, and the condition under which fired.

b. Unsatisfactory Report. Suggestions for improvement in manufacture, design, maintenance, safety, and efficiency of operation prompted by chronic failure and malfunction of the weapon, spare parts, or equipment should be reported on AF Form 54, "Unsatisfactory Report" with all pertinent information necessary to initiate corrective action. This form also will be used for reporting complaints on the application or effect of prescribed lubricants and preserving materials, and when so used, it should contain identifying details on both the products and the associated equipment. The report should be forwarded through the Commanding General, Air Matériel Command, Wright-Patterson Air Force Base, Dayton, Ohio, ATTN: UR Control, to the Chief of Ordnance, Washington 25, D. C., ATTN: ORDFM.

c. Air Force Form 185. AFR 136-5 establishes and prescribes the use of AF Form 185, "Maintenance and Performance Record, Aircraft Automatic Gun," which is used by all Air Force activities storing, issuing, operating, or maintaining aircraft automatic guns. Air Force Form 185 will remain with the aircraft automatic guns until the guns to which they pertain are disposed of by the Air Force, at which time they will be removed by the disposal agency and forwarded to Headquarters, Air Matériel Command, Wright-Patterson Air Force Base, Dayton, Ohio, ATTN: MCREXG.

Section II. DESCRIPTION AND DATA

3. Description

a. The 20-mm automatic gun T160 and the cal. .60 automatic gun T130 are gas-operated, belt-fed, electrically fired, percussion-charged weapons. By replacing key parts and relocating others, the gun may be assembled so as to be fed from either the left or right side. The description which follows is applicable to either the 20-mm or the cal. .60 weapon.

b. The distinguishing feature of the weapon is a drum assembly (figs. 3 and 4) containing five cartridge chambers parallel to its axis of rotation and mounted on a shaft within the drum cradle (figs. 3 and 4). The drum assembly is indexed during cycling so that each

chamber is brought, in turn, into alinement with the bore at the 6-o'clock position.

c. The barrel assembly (figs. 3 and 4) extends through a bearing in the front end of the receiver. The barrel assembly is fastened in the drum cradle with the breech end of the tube against the drum assembly. The tube is retained in the drum cradle by the interrupted threads and is locked in place by the barrel latch assembly.

d. The drum cradle (figs. 3 and 4) with the attached barrel and drum assembly are the major recoiling parts of the weapon. The recoil and counterrecoil forces which act on these components during firing are absorbed by two recoil spring assemblies housed in the receiver.

e. During firing, the chamber of the drum assembly in the 6-o'clock position is held in alinement with the tube. After firing, the drum is rotated by cam action of the rearward moving operating slide (par. 41) against the drum rollers (fig. 3). The reciprocating action of the operating slide is integrated by cam action to produce rotation of the drum assembly in either a clockwise or counterclockwise direction, depending upon whether a left-hand or right-hand feeder is used.

f. The operating slide is not a recoiling component of the weapon. A portion of the propellant gases produced by firing are bled from the tube to actuate a gas piston which forces the operating slide rearward. The operating springs (fig. 3) assist the operating slide in return to battery.

g. The feeder assembly (figs. 3 and 4) supplies rounds to the revolving drum assembly and is of the disintegrating link type. A five-station feeder sprocket arrangement within the feeder frame is driven by the feeder shaft, which is rotated by the drum. The sprockets maintain the rounds in alinement with the chambers of the drum assembly.

h. The extractor group (fig. 3) activated during the forward movement of the operating slide removes the cartridge case from its chamber. The extracted case travels at high velocity through the case ejection chute where it is deflected and directed to a point of disposal.

i. The firing circuit (fig. 4) carries the current from the connector, which is connected to an electrical source, to the firing pin. The continuity of the firing circuit is interrupted during cycling by the antidouble feed (fig. 4) to prevent subsequent firing of a round in the event a cartridge case was not extracted from the drum assembly.

j. The charger T13 (figs. 3 and 4) utilizes the cal. .30 carbine grenade cartridge M6 to develop gas pressure to cycle the operating slide. The cartridge is fired by a solenoid actuated firing mechanism.

4. Differences Between the 20-mm and Cal. .60 Guns

a. *General.* The external appearance of the 20-mm gun T160 and cal. .60 gun T130 are similar. The functioning of the two guns is the same and many of their components are interchangeable. However, some of the components are not interchangeable and it is these parts which must be replaced when changing a gun from a 20-mm to a cal. .60.

b. *Tube* (fig. 5). The over-all length of the 20-mm and cal. .60 tubes is the same. However, the size of the bore on the 20-mm tube is larger than the bore of cal. .60 and contains nine lands and grooves as compared to eight for the cal. .60. The rate of twist of the grooves in cal. .60 is greater than that of the 20-mm gun; also the opening in the tube orifice, for the bleeding of gas from the tube, is larger in the 20-mm gun.

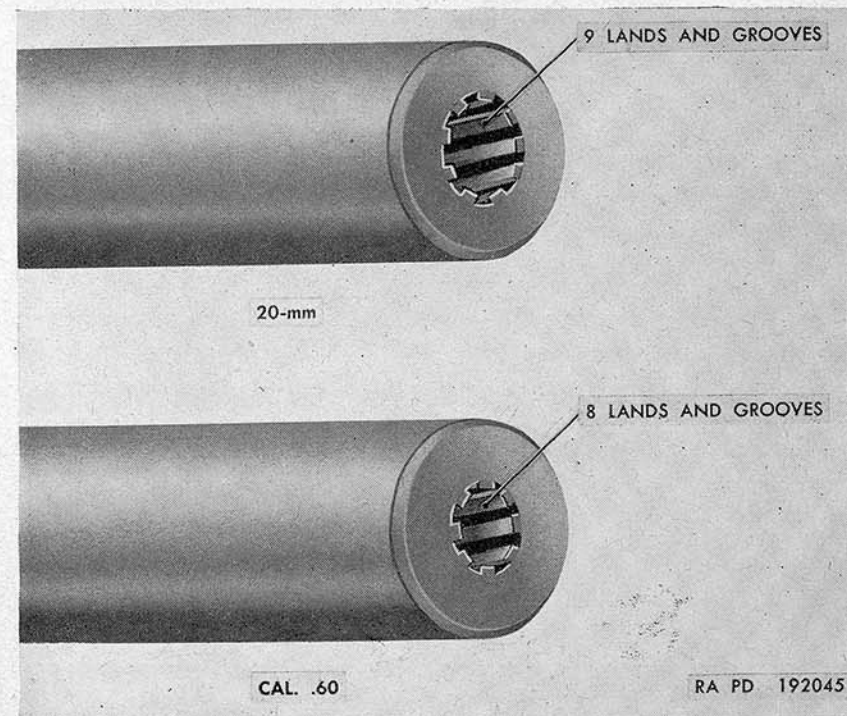


Figure 5. Comparison of tubes of 20-mm and cal. .60 guns.

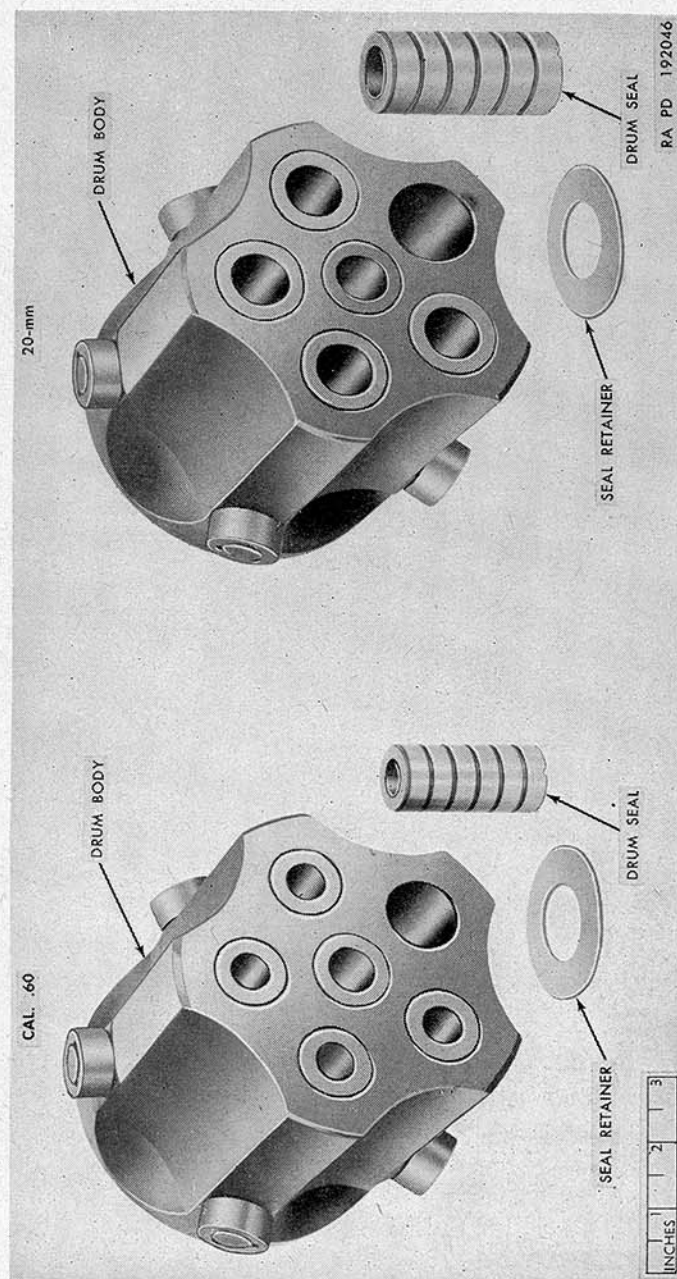


Figure 6. Comparison of drum assemblies of 20-mm and cal. .60 guns.

c. *Drum Assembly* (fig. 6). The drum bodies for the 20-mm and cal. .60 guns differ only in the diameter and depths of the bore for the drum seals. The drum seals for the 20-mm gun are longer and have a larger bore and outside diameter than the drum seals used for the cal. .60 gun. The drum seal retainer for the 20-mm gun is smaller in diameter than for the cal. .60 gun.

d. *Feeder Assembly* (fig. 7). The feeder assembly for the 20-mm gun is identical to the feeder assembly for the cal. .60 gun except for the front cartridge guide. The front cartridge guide of the cal. .60 feeder has a sharper bevel than has the 20-mm guide. These guides are marked 20-mm or cal. .60, respectively. The beveled surface of the guides conforms to a corresponding bevel at the projectile end of the cartridge case.

5. Identification Information

a. *Gun Serial Number*. The serial number of the gun is located on the top, forward end of the receiver (fig. 4) and is required to be used for all records concerning components of this matériel. All guns manufactured to date have been stamped with a serial number that is prefixed with FX (fig. 4) to identify the gun. Although interchangeable, the major components of the gun will also be stamped with the corresponding gun serial number to identify them as part of the gun when not assembled to it.

b. *Tube*. The tube serial number (fig. 8) is stamped on the gun tube just forward of the interrupted thread.

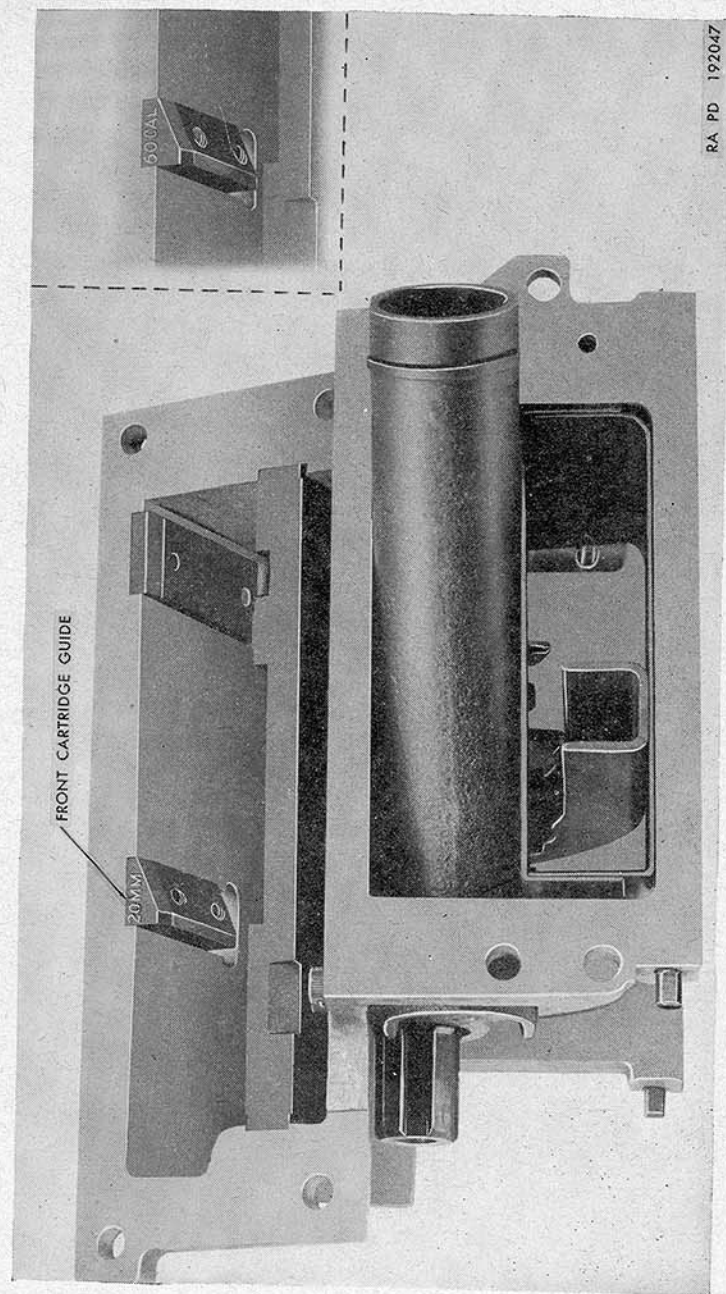


Figure 7. Comparison of feeder assemblies of 20-mm and cal. .60 gun—left-hand feeder shown.



Figure 8. Serial number location on gun tube.

Note. The serial numbers on the receiver and the tube will usually differ. The serial number on the receiver is the actual number of the gun. However, any reports sent in should give both serial numbers.

6. Tabulated Data

Data pertaining to the 20-mm and cal. .60 automatic guns are as follows:

Weight of 20-mm gun (completely assembled).....	179.0 lb
Weight of cal. .60 gun (completely assembled).....	182.0 lb
Weight of 20-mm tube.....	29.6 lb
Weight of cal. .60 tube.....	32.0 lb
Length overall.....	72.4 in
Length overall of tube.....	53.6 in
Rifling:	
Number of grooves of 20-mm tube.....	9
Number of grooves of cal. .60 tube.....	8
Twist (direction).....	right-hand
Twist of 20-mm tube (one turn in).....	20 in
Twist of cal. .60 tube (one turn in).....	18 in
Operation.....	gas-operated
Feed.....	link belt
Current applied through firing pin.....	200 v dc
Current applied to charger.....	24 v dc
Cooling.....	air
Length of recoil.....	0.25 in (aprx)
Slide stroke.....	5½ in
Velocity of extracted cases.....	60-70 fps

CHAPTER 2

OPERATING INSTRUCTIONS

Note. Controls, instruments, and sights used for firing these guns are the responsibility of the Air Force and are covered in pertinent Air Force technical orders.

Section I. SERVICE UPON RECEIPT OF MATÉRIEL

7. General

a. When new or reconditioned matériel is first received by the using organization, it is necessary for the organizational mechanics to determine whether the matériel is complete and has been properly prepared for service by the supplying organization.

b. A record should be made of any missing parts and of any malfunctions. Any such conditions should be corrected as quickly as possible.

c. Attention should be given small and minor parts as these are the more likely to become lost and may seriously affect the functioning of the matériel.

d. The matériel should be cleaned and prepared for service in accordance with the instructions given in paragraphs 8 and 9.

8. New Matériel

a. Unpack gun from its shipping container.

b. Remove preservative compound as indicated in paragraph 11.

c. Disassemble the matériel as outlined in paragraph 10.

d. Thoroughly clean the gun by wiping the film of oil from all parts. Check rearward ends of drum seals and other surfaces exposed to powder fouling. Check parts for cracks and other visual defects.

Note. It will be noticed that some of the moving parts will show what appears to be slight wear. Each new weapon is test fired which has the effect of wearing away portions of the protective finish applied to the component parts. This is a normal condition and not to be construed as excessive wear.

e. Clean bore using cleaning rod and patches (par. 35).

f. Clean drum chamber and drum seal seats (par. 35).

g. Check the ways in the receiver for burrs or other obstructions which may hinder the rearward and forward movement of the operating slide, switch cam, and drum cradle (par. 85).

h. Check matériel to see that all technical orders have been applied. Current technical orders are indexed numerically and alphabetically in TO 00-1-1 and TO 00-1-2, respectively.

i. Lubricate as outlined in paragraph 32 and assemble the gun.

j. Check electric firing circuit (par. 127).

k. Check functioning of charger (par. 48).

l. Check functioning of feeder (par. 47).

m. Check action of extractor (par. 145).

n. Check Air Force technical orders for any special equipment used with this matériel which is the responsibility of the Air Force. Different types of aircraft use various types of equipment.

9. Used Matériel

Used matériel requires the same inspection and service prescribed for new matériel (par. 8) and, in addition, check all parts of the matériel for signs of excessive wear, damage, missing parts, or corrosion, and correct any deficiencies.

10. Disassembly of Matériel Prior to Cleaning

a. Remove barrel assembly (par. 51).

b. Remove slide operating springs and receiver end plate (par. 62).

c. Remove feeder mechanism and disassemble shaft and sprockets (pars. 56 and 57).

d. Remove drum assembly and withdraw drum seals (pars. 66 and 67).

e. Remove drum cradle with its attached units (par. 72).

f. Withdraw operating slide and switch cam.

g. Remove charger and take out cartridge cylinder (pars. 17b and 84a).

11. Cleaning Guns and Components Coated With Rust-Preventive Compound

a. All guns and components of guns received from storage which are coated with rust-preventive compound will be thoroughly cleaned with waste, wiping cloth, or a brush saturated with dry-cleaning solvent or volatile mineral spirits or a solution of four parts dry-cleaning solvent or volatile mineral spirits and one part grease-cleaning compound. Vapor degreasing or steam jet may be used to facilitate removal of compound, if available. After complete removal of compound, lubricate the gun immediately as outlined in paragraph 32.

b. Component parts of each gun should be cleaned separately. Although like parts are interchangeable, the parts originally assembled to the gun work best together.

c. When cleaning any component wherever the rust-preventive compound can accumulate, particular attention should be given to remove all of the compound. This situation applies especially to the operating slideways located in the base of the receiver. Rust-preventive compound if left to accumulate in this area will cause sluggish return of the operating slide, and consequently slow firing of the weapon.

12. Cleaning Guns in Use

a. Rifle-bore cleaner is used for cleaning the weapon after it has been fired or for periodic cleaning as outlined in preventive maintenance services (par. 34).

b. Rifle-bore cleaner contains a volatile solvent which evaporates at temperatures above 150° F. thus reducing the cleaning action. Therefore, after firing, the weapon should not be cleaned until it has cooled.

Note. Rifle-bore cleaner is not a lubricant. Parts which require lubrication will be wiped dry and oiled.

c. Do not use dry-cleaning solvent or volatile mineral spirits for cleaning powder-fouled parts because these solvents will not readily dissolve the corrosive salts from powder and primer compositions.

d. Dry-cleaning solvent and volatile mineral spirits are inflammable and should not be used near an open flame. Fire extinguishers should be provided when these materials are used. In addition, they evaporate quickly and have a drying effect upon the skin. If used without gloves, they may cause cracks in the skin and in the case of some individuals a mild irritation or inflammation. Use only in well ventilated places.

Section II. OPERATION UNDER USUAL CONDITIONS

13. General

Information in this section is concerned with the steps necessary to operate the gun under usual conditions. Usual conditions are considered to be a temperate climate with moderate temperature and humidity. In the case of this aircraft gun, usual operating conditions are the atmospheric conditions ordinarily encountered when flying at low altitudes in a temperate zone. Preventive maintenance of the gun described in this manual refers to maintenance under usual condi-

tions except where otherwise stated as in paragraphs 22 through 27. When flying at high altitude is anticipated, refer to paragraph 24.

14. Mounting the Matériel

Installing this gun in aircraft is the responsibility of the Air Force. Instructions for mounting the gun in aircraft are covered in Air Force technical orders.

15. Converting From 20-mm to cal. .60 Gun

a. *General.* When changing a gun from a 20-mm to a cal. .60 weapon, the following areas are affected: the drum, the feeder, and the barrel.

b. *Drum Assembly.* Remove drum assembly in accordance with (par. 66) and install cal. .60 drum assembly (par. 70).

c. *Feeder Assembly.* Remove the front cartridge guide (par. 57) and install the corresponding guide for cal. .60 cartridges.

d. *Barrel Assembly.* Remove the 20-mm barrel assembly (par. 51) and install the cal. .60 barrel assembly (par. 54).

16. Converting From Right-Hand to Left-Hand Feed

a. *General.* In order to change a gun from a left-hand feed to a right-hand feed, or vice versa, the following components must be altered or replaced: the drum cradle group, the feeder mechanism, the operating slide, and the switch cam. The description which follows is for changing a gun from right-hand feed to left-hand feed, but the steps are identical to those which must be followed when changing a gun from left-hand feed to right-hand feed.

b. *Disassembly of Gun for Changing Feed.*

- (1) Remove feeder assembly (par. 56).
- (2) Remove drum assembly (par. 66).
- (3) Remove operating springs and receiver end plate (par. 62).
- (4) Remove barrel assembly and drum cradle group (pars. 51 and 72).
- (5) Remove operating slide and switch cam (par. 78).

c. *Major Parts To Be Replaced.*

- (1) Right-hand feeder assembly.
- (2) Right-hand switch cam.

d. *Major Parts To Be Altered.*

- (1) Operating slide.
- (2) Drum cradle group.

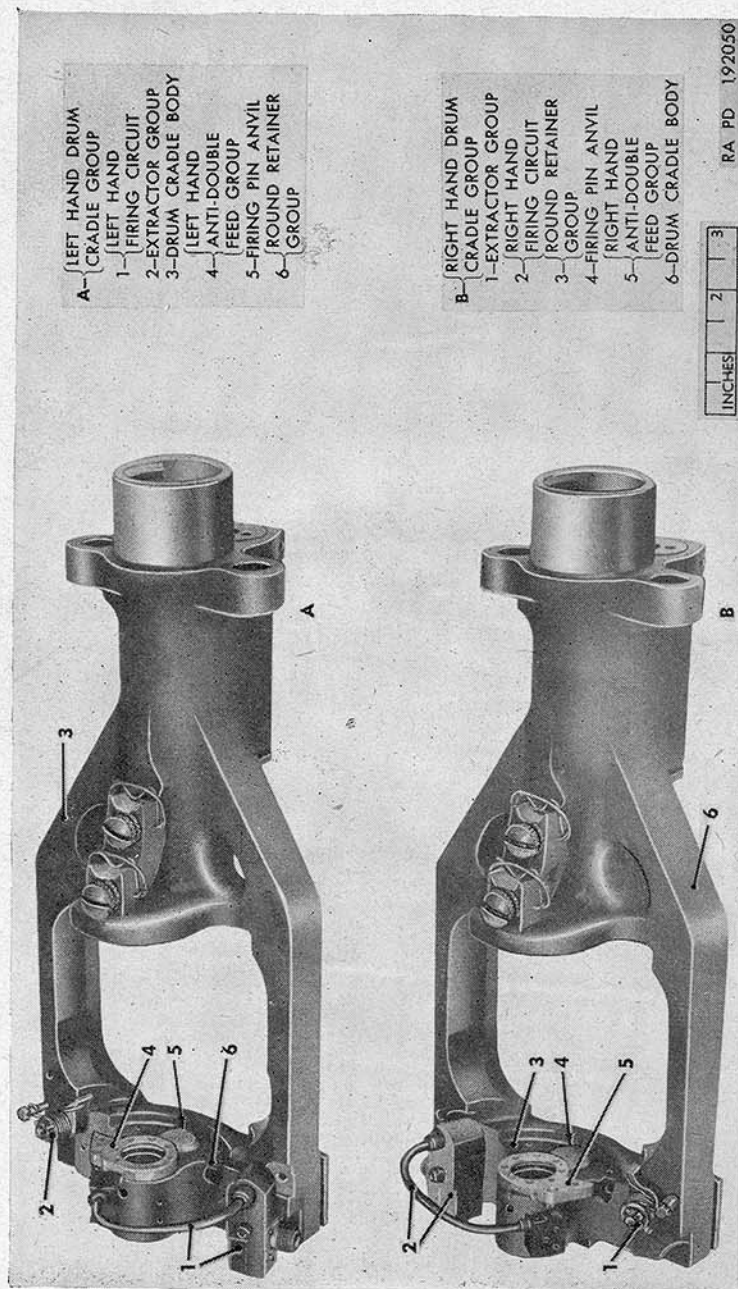


Figure 10. Comparison of drum cradle groups as prepared for left-hand and right-hand feed.

- (e) Remove extractor bushing (par. 73e) from right side of drum cradle body, and reposition in corresponding hole on left side (par. 75a).
- (f) Install extractor group on left side of drum cradle (fig. 10) using a left-hand extractor spring and a left-hand extractor shaft (par. 75a).
- (g) Install round retainer group (fig. 10) in corresponding round retainer well on right side of cradle (par. 75b).
- (h) Obtain left-hand firing circuit (fig. 10) and install on drum cradle body (par. 75d).
- (i) Obtain left-hand antidouble feed group (fig. 10) and install on drum cradle body (par. 75e).

g. Feeder Assembly. The feeder assembly for left-hand feed and for right-hand feed are completely different units (fig. 11). They are issued as left-hand and right-hand units.

h. Switch Cam. The left-hand and right-hand switch cams are shown in figure 12. The right-hand switch cam can be identified by having the straight portion of its cam path on its left side. The left-hand switch cam has it on the right side.

i. Assembly of Converted Gun.

- (1) Install the left-hand switch cam and converted operating slide in the ways of the receiver (par. 82).
- (2) Install the altered drum cradle group in the receiver (par. 76).
- (3) Install the drum assembly in the drum cradle (par. 70).
- (4) Install the left-hand feeder assembly on the receiver (par. 60).
- (5) Install the operating springs and receiver end plate group (par. 64).
- (6) Install barrel assembly (par. 54).

17. Location and Operation of Charger

a. Location. The percussion charger T13, used with the weapon, is located at the forward end of the receiver (figs. 3 and 4). Provision is made for its installation on either side of the gun for possible left-hand or right-hand charging. The charger fires cal. .30 carbine grenade cartridges M6 which develop sufficient gas pressure to cycle the gun once.

b. Loading Charger Cylinder. To load the charger with cartridges, it is necessary to remove the charger cylinder from the charger. To do so, perform the operations in (1) through (4) below.

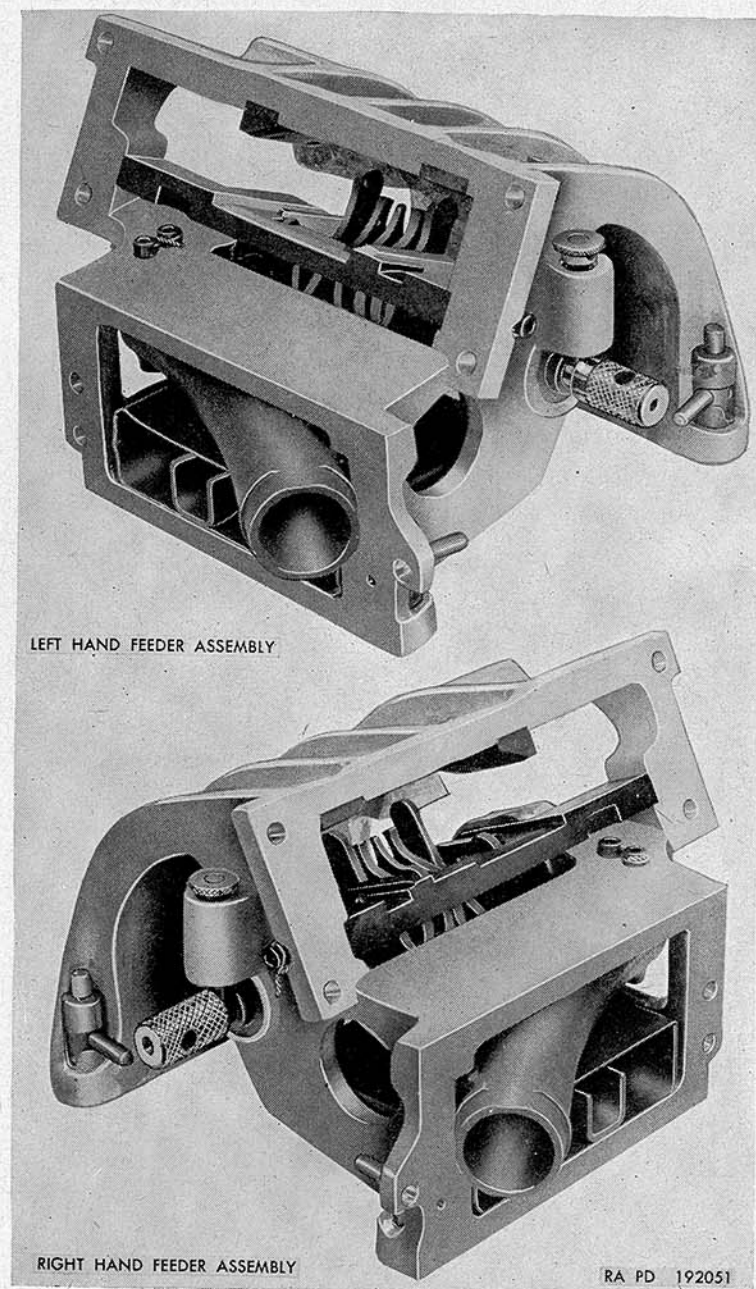


Figure 11. Comparison of left-hand and right-hand feeder assemblies.

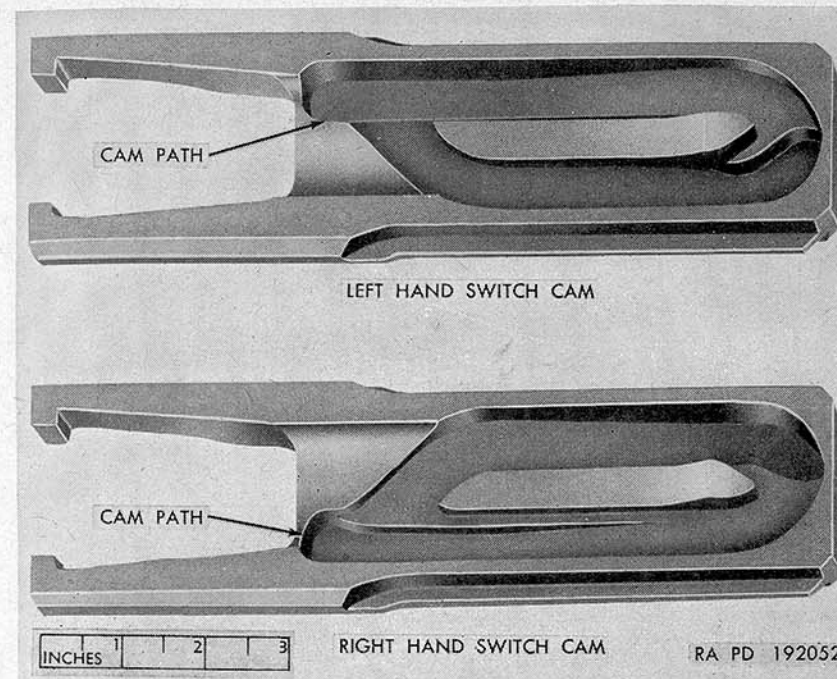


Figure 12. Comparison of left-hand and right-hand switch cams.

- (1) Depress the lock latch (fig. 13) with the thumb and grasp the solenoid housing (fig. 14) pulling it rearward to free the cylinder.
- (2) Shake cartridge cases from cylinder and insert live rounds. Install cartridges from rear of cylinder (fig. 15).
- (3) Depress the lock latch and retract the frame and solenoid housing (figs. 13 and 14). Insert the cylinder in its recess in the frame and center it so that the cylinder shaft (fig. 14) contacts the spindle extension within the frame.
- (4) Release the lock latch and allow the frame housing to move forward. Be sure the spindle extension contacts the cylinder shaft and forces it forward to lock the cylinder in place.

c. Operation of Charger. To operate the percussion charger T13, it must be connected to a 24-volt direct-current source by means of the electrical connector (fig. 13). Applying voltage to the circuit, by means of an external switch, energizes the charger solenoid and fires one cartridge in the charger cylinder (par. 48).

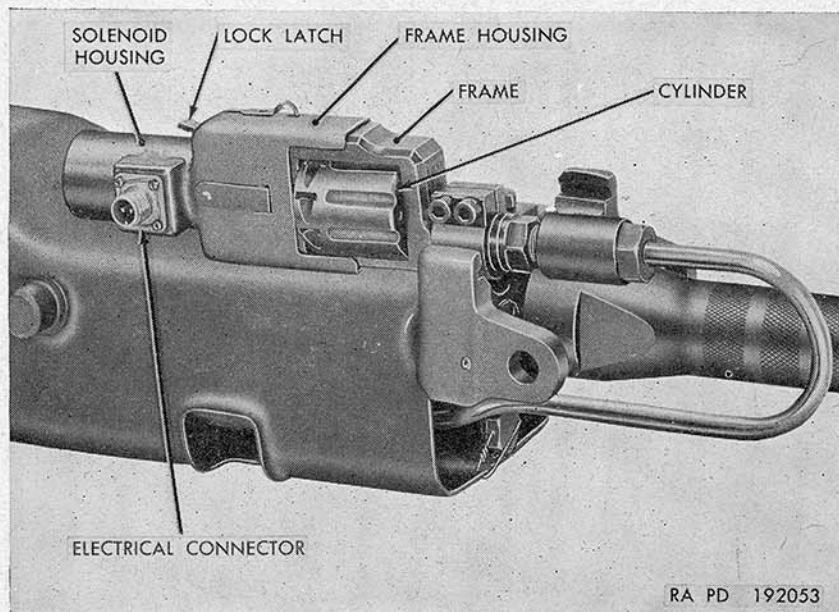


Figure 13. Percussion charger T13 installed on receiver.

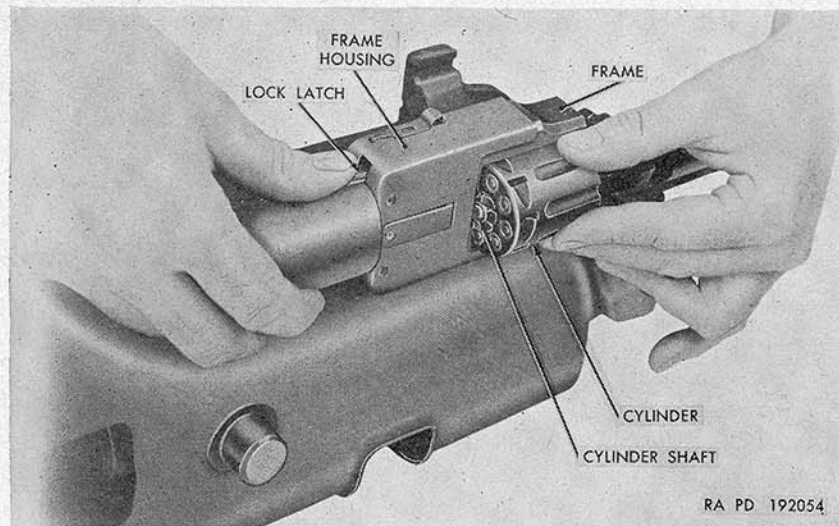


Figure 14. Removal of charger cylinder from frame.

18. Loading Belts

a. General. Belts for the 20-mm weapon and the cal. .60 weapon are made up of metallic links T61E2 (fig. 16). There is no difference in the belting procedure for left-hand or right-hand feed. In belting for right-hand feed however, remove the connecting eye from the link of the first round. This is to prevent the possibility of a jam in the feeder sprockets. The belting operation is performed on the linking machine T38 (figs. 17 and 18).

b. Belting Procedure.

- (1) Inspect all links for rust, dirt, or deformation. Before using, dip links in preservative lubricating oil (special) and drain off the excess. Dip a clean wiping cloth in preservative lubricating oil (special) and wring it out; oil the cartridge cases with it, being careful not to oil the primer or the point where the case is crimped to the projectile.
- (2) Connect the linking machine ground contact (figs. 17 and 18) to some suitable metallic object such as a pipe or radiator.



Figure 15. Loading charger cylinder.

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- (3) Lay 12 empty links T61E2 across the forward end of the linking machine so that each link is separated by a link separator (figs. 17 and 18) and bears against the link stop (fig. 18).
- (4) The connecting eyes (fig. 16) of each link, located on left side, should be hooked to the link connector of the empty link to its left. This will form a continuous belt. If it is known that the belt is to be used for right-hand feed, remove connecting eye from first link on left side of machine.
- (5) Check adjustment of linking machine before inserting rounds as follows:
 - (a) Place one 20-mm or cal. .60 round in the groove of the cartridge guide (fig. 17) which is furthest to the left side of the machine.
 - (b) Rotate handle (figs. 17 and 18) forward to move pusher plate assembly against cartridge, thereby forcing cartridge into link.
 - (c) Continue to apply pressure to pusher plate assembly until the groove around the base of the cartridge is engaged by the positioning detent (fig. 16) of the link.

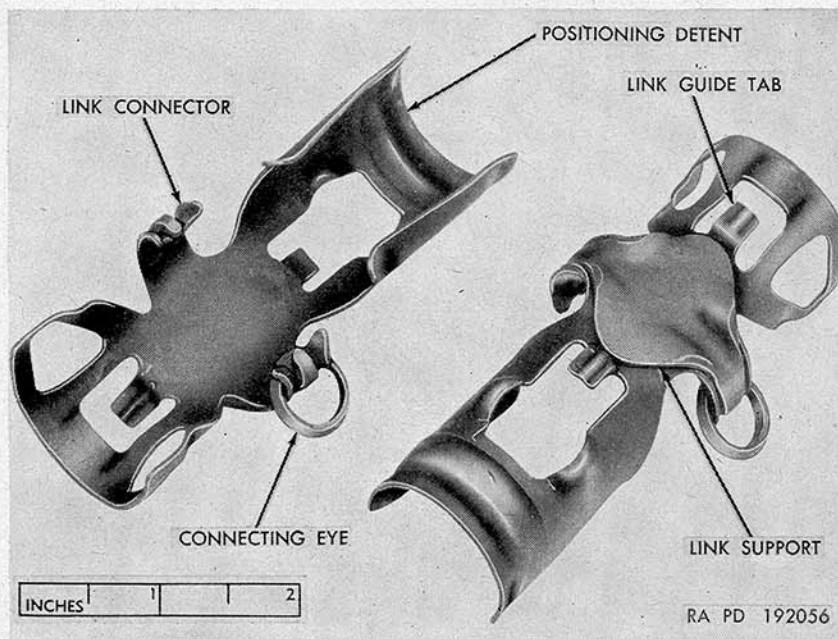


Figure 16. Metallic link T61E2—top and bottom view.

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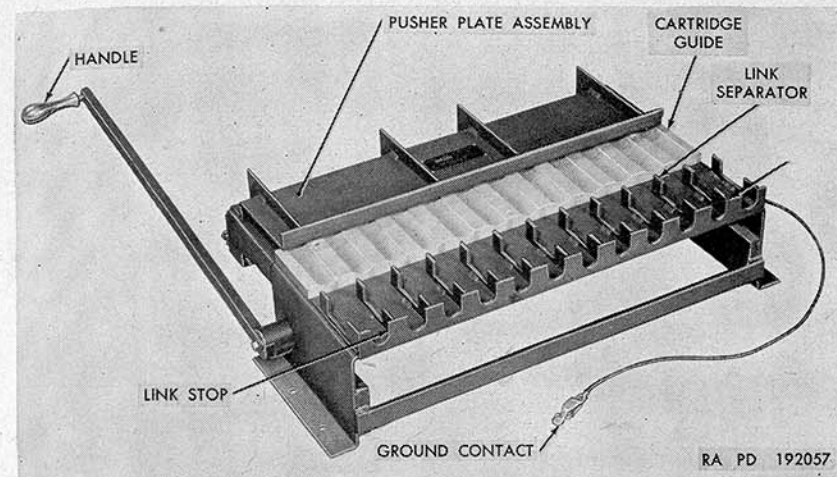


Figure 17. 20-mm and cal. .60 linking machine T38—front view.

- (d) Loosen the adjusting screw nut (fig. 19), and turn the adjusting screw clockwise so that it moves inward toward the front of the linking machine. Turn the screw until it contacts the frame. Lock the adjusting screw in place with the adjusting screw nut.
- (e) If the adjusting screw is set too far forward, the positioning detent of the link will not engage the groove of the cartridge. In this case, it will be necessary to withdraw the screw to allow additional forward movement of the pusher plate assembly.
- (6) Lay 10 additional 20-mm or cal. .60 rounds in the grooves of the cartridge guide, leaving the link on the right side empty (fig. 20).
- (7) Rotate the handle forward (fig. 21) and seat the rounds in the links. Be sure each cartridge is engaged at its groove by the positioning detent on the link. Rotate handle rearward.
- (8) Lift completed belt from machine and move empty link (fig. 21) from the right side of the machine to the stall furthest to the left. Repeat operations described in (3), (4), (6), and (7) above until a belt of desired length is obtained.
- (9) Test the belt for flexibility by turning the completed belt over; grasp the last round, and draw it across the rest of the completed belt. Any faulty link will cause the belt to kink instead of folding over smoothly. Any link whose connect-

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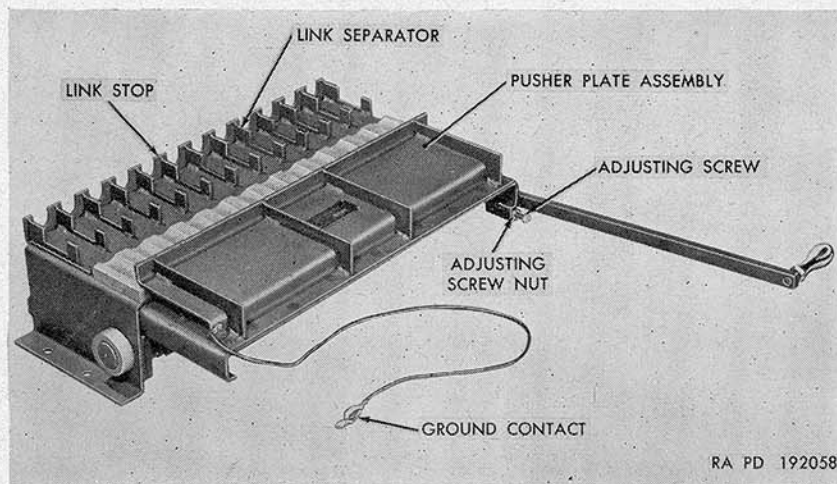


Figure 18. 20-mm and cal. .60 linking machine T38—rear view.

ing eye does not allow the round to hinge freely must be replaced by another link and the test repeated. The test must be performed in both directions, from left to right and from right to left.

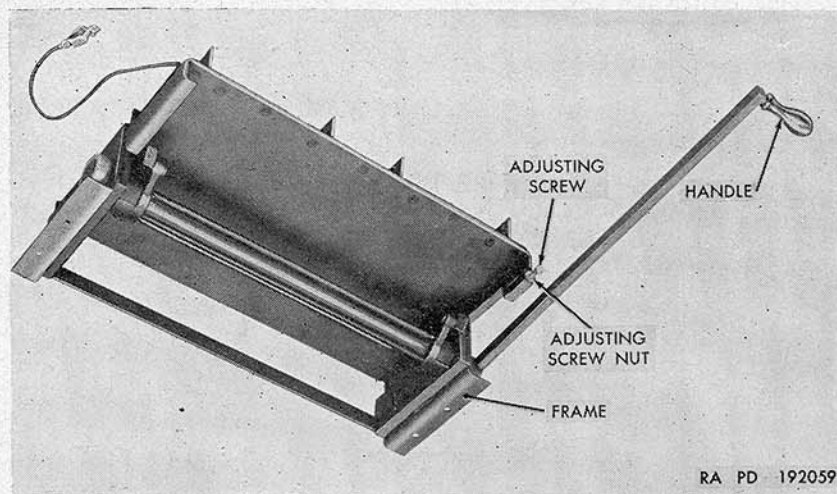


Figure 19. Linking machine T38—bottom view.

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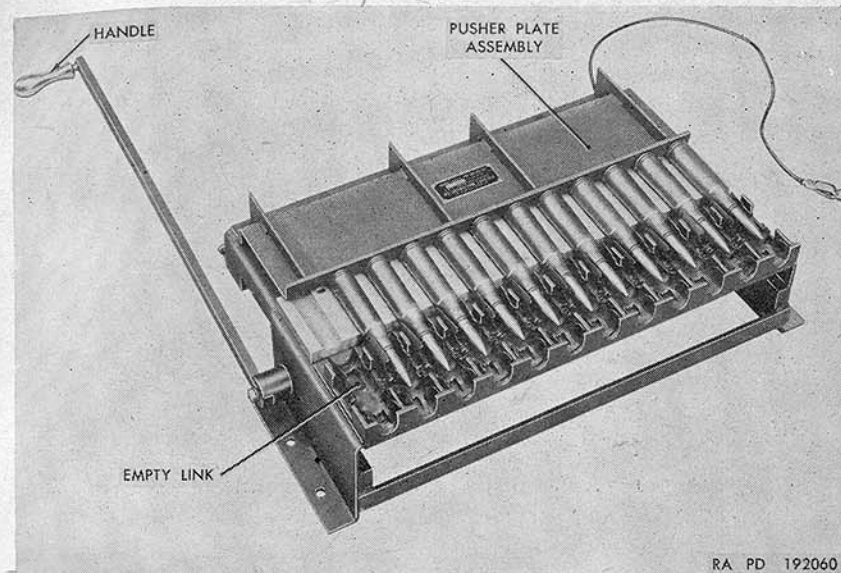


Figure 20. Rounds in position to be forced into links.

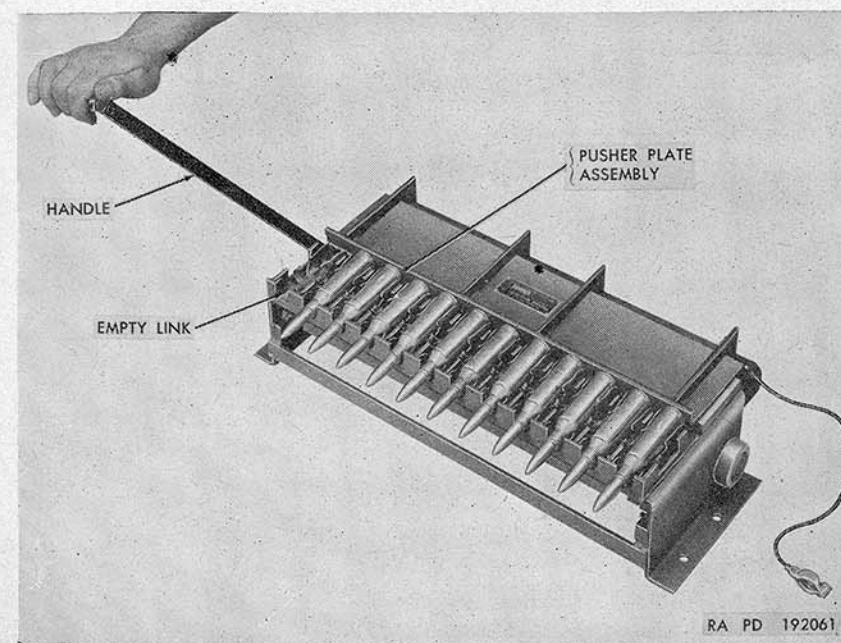


Figure 21. Rounds seated in links forming belt.

19. Loading, Feeding, and Chambering

a. Definitions.

- (1) Loading refers to the proper positioning of a loaded belt into the feedway of the feeder mechanism.
- (2) Feeding includes any mechanical action, subsequent to loading, which extracts a round from the belt and places it in line with the chamber.
- (3) Chambering is the seating of the round in the chamber.

b. Procedure.

Note. A feed chute is necessary for proper loading of the feeder assembly. These feed chutes are the responsibility of the Air Force and are not issued by the Ordnance Department.

- (1) Check to see that the ammunition is properly loaded in the belt (par. 18). If the belt is going to be loaded in a right-hand feed mechanism, be sure that the connector eye (fig. 16) on the leading link is removed to avoid a possible link jam in the feeder sprockets.
- (2) Check Air Force technical orders to see that feed chute is in proper alignment and securely assembled to the feeder assembly.

Caution: Before loading gun, be sure that the current supply to the firing circuit (fig. 4) is disconnected.

- (3) Slide belt down feed chute into feed mouth of feeder assembly (fig. 22). Be sure that the link guide tabs (fig. 23) position themselves under the "L" slot of the link guide and the round rests firmly against the feeder sprockets. Maintain pressure against the rounds in the feeder assembly by pushing against the external rounds (fig. 22).
- (4) Cycle the operating slide (par. 87) by firing the charger once or by using the operating slide rammer hook 7188569 (fig. 27). If the rammer hook is used, it will be necessary to remove one or both operating springs (par. 62). To fire charger, connect the electrical connector on the charger (fig. 13) to 24-volt direct-current source and apply current to solenoid by pressing switch. Charging the gun once allows the operating slide feed rammer (fig. 9) to remove one round from the belt and partially chamber it in the drum.

- (5) Again cycle the operating slide. This completes chambering the first round and also feeds a second round to the first drum position.

Note. An additional cycling of the operating slide will position a round in the 6-o'clock firing position of the drum assembly (par. 38). It is therefore recommended that the slide be cycled only twice on the ground and the third time just before firing is anticipated in the air.

- (6) Connect the 200-volt direct-current power source to the firing circuit connector (fig. 4), being sure the firing switch in the aircraft is in the "OFF" position.

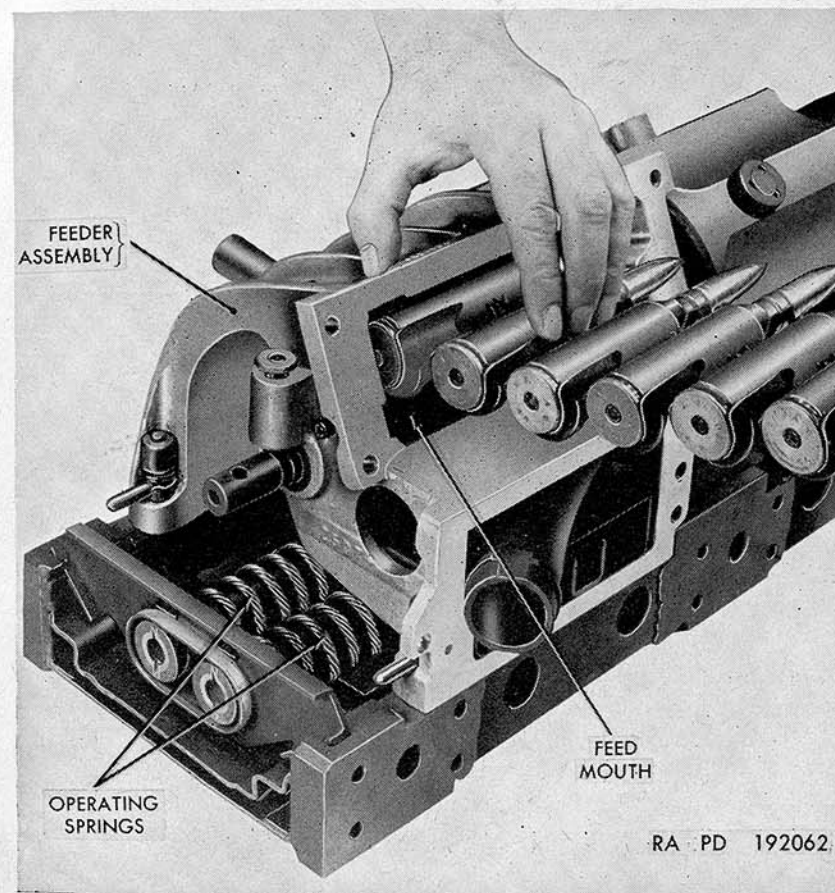


Figure 22. Loading belt into feeder assembly—feed chute removed—right-hand feed.

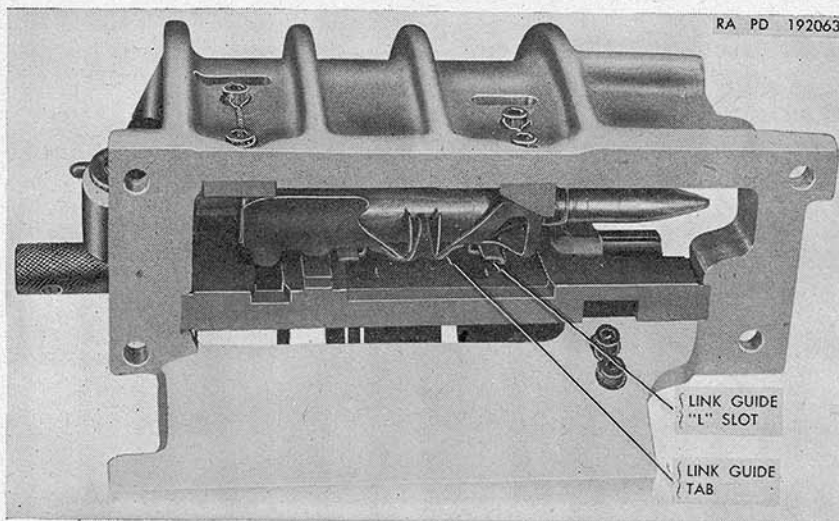


Figure 23. Round properly positioned in feed mouth of feeder assembly—right-hand feed.

20. Firing Gun

a. Charging. Once the plane is airborne, and firing is anticipated, turn the power switch on and depress the charger switch. This will seat the first round in firing position.

b. Firing. Turn on power supply to the firing circuit. To fire, depress firing switch. To cease firing, release firing switch. If no further firing is anticipated, turn off power supply to firing circuit.

c. Corrections of Stoppages in Combat Firing.

- (1) A stoppage is the result of a malfunction of the gun usually caused by an improper or incomplete action of some part of the gun, its equipment, or ammunition. Malfunctions, their probable causes, and corrections are covered in table III (par. 49).
- (2) The design of the gun and its location outside the reach of the gunner usually makes it impossible to remedy stoppages during combat firing.
- (3) When a stoppage occurs during combat firing, recharge the gun immediately if recharging is possible, and attempt to fire. If the gun cannot be recharged, no corrective action is possible.
- (4) If a failure to extract occurs, the gun will not fire because the antidouble feed device will keep the firing circuit open. Recharging the gun under these conditions will break the

antidouble feed spring. This will necessitate the springs replacement when the aircraft returns to its base.

21. Unloading

a. Check to see that the power supply to the firing circuit is turned off.

b. Disconnect the feed chute from the feeder assembly.

c. Remove feeder assembly from the gun (par. 56) with what remains of the ammunition belt.

d. Turn the feeder assembly over on a table and allow the belt to hang over the table edge, creating drag on the feeder sprockets.

e. Insert some suitable object such as a drift or Allen wrench through the hole at the rear of the feeder shaft (fig. 24). Apply pressure by rotating the shaft clockwise (looking from rear). This operation applies to a right-hand feed.

f. Using a brass or hard rubber hammer, tap the feeder sprockets until the round positioned in the feed mouth is released.

g. Remove operating springs (par. 62).

h. Grasp rammer on operating slide and cycle operating slide three times to remove three rounds which are still in the drum assembly.

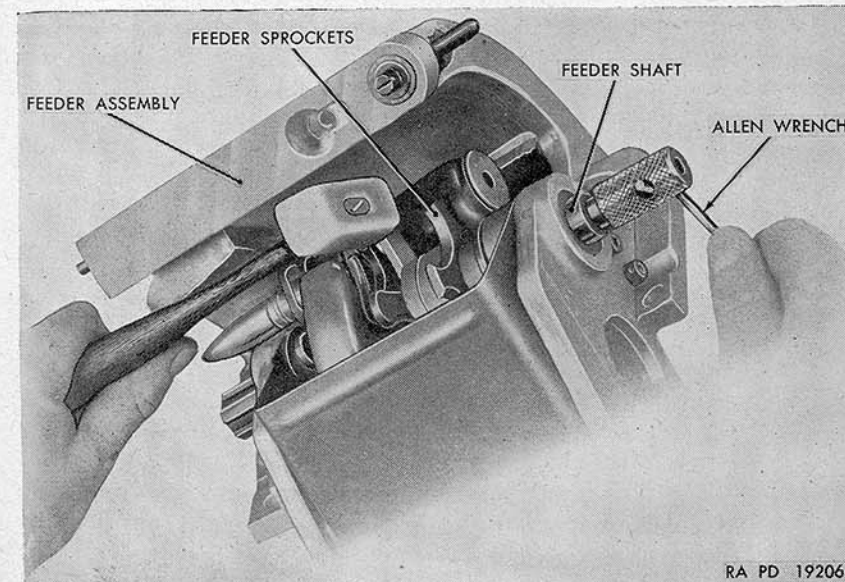


Figure 24. Unloading ammunition belt from feeder assembly—right-hand feed.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

22. General

a. The mechanical steps of operation under unusual conditions are the same as for operation under usual conditions as explained in paragraphs 13 through 21. The only difference in procedure is the servicing of the gun with regard to cleaning and lubrication to insure proper functioning where extremes of temperatures and humidity occur. Special care should be observed with regard to cleaning and lubrication of the gun as explained in this section. Such care is most necessary to insure proper operation and functioning of the mechanism, and to guard against excessive wear of the moving parts and deterioration of the matériel.

b. Under any condition, the bore and chamber of the barrel must be wiped free of excess oil before firing or mounting the gun in the airplane for combat (par. 32*b*(2)).

23. Extreme Cold-Weather Operation

a. In temperatures below freezing, it is essential that all moving parts be kept free of moisture. It has been found that excess oil on the working parts will solidify to such an extent as to cause sluggish operation or even complete failure.

b. If guns are left mounted in the airplanes, the exposed parts should be carefully covered for protection and to prevent frosting.

c. When guns are moved from an airplane and taken into a warmer area, such as a heated building, moisture will condense upon the cold surface. This condition is known as "sweating." It can be prevented as follows:

- (1) Do not bring cold matériel indoors unless it is absolutely necessary. It is best to leave it outdoors but protected from the elements with proper covers.
- (2) If it is necessary to bring guns and other equipment from low temperatures to room temperatures, the use of anti-condensation containers is recommended. These containers can be specially made tight-fitting cloth-framed boxes or any other fairly airtight containers with heat conducting walls. Place the cold equipment in the container. Have containers at outside temperature so that it will contain cold dry air. Close the top, bring it indoors, and allow it to warm up. The cold dry air expands as it warms, breathing outward, and

therefore, no warm humid air from the room comes in contact with the matériel and there is no condensation on it. When the matériel is entirely at room temperature, it may be removed from the container.

- (3) If condensation forms on the gun, it must be disassembled (par. 10), thoroughly dried, and lubricated after it reaches room temperature to prevent rust or corrosion. Do not operate the matériel before thoroughly drying, as the moisture will form an emulsion with the oil or grease, necessitating the removal of the emulsified lubricant and lubricating the matériel. Do not move matériel having condensate on it, into the outdoor temperature, as the parts will become covered with frost and may not function.
- (4) If the guns are to be mounted in the airplane immediately, they should be coated with special protective lubricating oil as outlined in paragraph 32.
- (5) If the gun is not to be mounted in the airplane immediately, medium preservative lubricating oil should be used to prevent rusting, and the gun should be inspected weekly. Before mounting guns in the airplane for combat, the medium oil should be removed with dry-cleaning solvent or volatile mineral spirits, and the gun should be very lightly lubricated as outlined in paragraph 32.

Note. Great care should be used to insure the removal of all excess oil from the guns, especially from moving parts. Operating slideways and switch cam ways, operating springs, tunnels in operating slide in which they operate, switch cam, spring and spring seats, and like places should be free of excess oil. Excess oil will congeal at low temperatures and cause sluggish action or even malfunction of the gun.

- (6) Remove all excess oil from bore and drum chamber before firing.

24. High-Altitude Flights

When airplanes are operated in moderate climates at high altitudes, where extremely low temperatures are encountered, condensation of moisture on the guns may occur when returned to ground temperature. In such cases, guns should be inspected, disassembled, dried, cleaned, and lubricated as prescribed in paragraph 23. When high-altitude flights are anticipated, guns should be lubricated very sparingly. Remove all excess oil from bore and drum chamber before firing.

25. Operation in Extreme-Hot Weather Conditions

a. In hot climates the thin film of oil necessary for guns under combat conditions will be quickly dissipated. Inspect guns frequently and renew oil film as often as is necessary to prevent rusting and assure the gun being ready for combat when kept mounted in the airplane. Clean guns frequently to remove dust or grit which will stick to all surfaces.

b. Keep guns covered as much as possible.

c. Perspiration from the hands is a contributing factor to rusting because perspiration contains acid. When handled, guns should be wiped dry frequently and the oil film maintained.

d. When guns are not to be mounted in the airplane, they should be cleaned with rifle-bore cleaner, and then lubricated with medium preservative lubricating oil if their use is not anticipated for a prolonged period of time (20 days or more). Before mounting guns in airplanes, remove the medium oil and lubricate the gun as outlined in paragraph 32. Remove all excess oil from bore and drum chamber before firing.

e. Where humidity is high, take special care to inspect unexposed surfaces such as the bore and chamber, inside of barrel and drum, and places where rusting might occur and not be quickly noticed. Watch screws and pins to prevent rust attacking and "freezing" them in place.

26. Operation Under Sandy or Dusty Conditions

a. In localities where dust and sand storms are prevalent, guns should be kept covered at all times, whether mounted in planes or not. Dust and sand will enter the drum and bore and stick in lubricated surfaces, forming a gummy paste which may clog the gun and cause malfunction. This paste will also act as an abrasive and cause undue wear of the moving parts of the gun. Under such conditions, remove guns from the airplane as often as practical and thoroughly clean and lubricate them. Lubrication should be confined to moving parts and contacting surfaces and should be as light as possible for proper functioning of the gun.

b. After a dust or sand storm, guns should be disassembled and thoroughly cleaned, inspected, and lubricated as in *a* above. Remove all excess oil from bore and chamber before firing.

27. Operation Under Moist or Salt-Atmosphere Conditions

a. Salty moist air is conducive to quick rusting, as the salt tends to emulsify the oil and destroy its rust-preventive qualities. When mounted in the planes, guns should be kept lightly lubricated and inspected frequently and treated in the manner similar to that described for guns in paragraph 26.

b. When dismounted, they should be thoroughly cleaned and lubricated with medium preservative lubricating oil if their use is not anticipated for a prolonged period of time (20 days or more). If special preservative lubricating oil is used, guns should be inspected daily.

c. Before mounting guns in the airplane, they should be thoroughly cleaned to remove all excess oil and then lubricated as outlined in paragraph 32. Remove all excess oil from chambers and tube before firing.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. PARTS, SPECIAL TOOLS, AND EQUIPMENT FOR ORGANIZATIONAL MAINTENANCE

28. General

Tools, equipment, and spare parts are issued to the using organization for maintaining the matériel. Tools and equipment should not be used for purposes other than prescribed and, when not used, should be properly stored.

29. Parts

Organizational spare parts are supplied to the using organization for replacement of those parts likely to become worn, broken, or otherwise unserviceable, providing such operations are within the scope of organizational maintenance functions. Organizational spare parts and organizational tools and equipment supplied for the 20-mm automatic gun T160 and cal. .60 automatic gun T130 will be listed in the Department of the Army Supply Catalog on the matériel. See ORD 1 for availability. See also ORD 6 SNL J-12 for the squadron tool set.

30. Common Tools and Equipment

Standard and commonly used tools and equipment having general application to this matériel are listed in ORD 6 SNL J-10, section 1, and are authorized for issue by T/O & E. They are not specifically identified in this manual.

31. Special Tools and Equipment

Certain tools and equipment specially designed for organizational maintenance, repair, and general use with the matériel are listed in table I for information only. This list is not to be used for requisitioning replacements.

Table I. Special Tools and Equipment for Organizational Maintenance

Item	Identifying No.	References		Use
		Fig.	Par.	
BRUSH, bore, 20-mm, M25.	7225087	----	35c(1)(a)-----	To clean 20-mm bore.
BRUSH, cleaning, cal. .60--	7161760	----	35c(1)(a)-----	To clean cal. .60 bore.
CASE, cleaning rod, cal. .60.	7161757	----	35c(1)(a)-----	Cover for cal. .60 cleaning rod.
COMPRESSOR, spring, drum shaft and barrel latches.	7188578	25	75g(6)-----	To remove barrel latch assembly and drum shaft latch assembly.
HOOK, lifting, drum-----	7188573	26	66d-----	To remove drum during disassembly.
HOOK, rammer-----	7188569	27	19b(4)-----	To cycle gun manually.
ROD, cleaning, jointed, cal. .60.	7161750	----	35c(1)(a)-----	To attach to brush for bore cleaning.
STAFF, cleaning, 20-mm, M13.	5570631	----	35c(1)(a)-----	To attach to brush for bore cleaning.
TOOL, operating spring, removing or replacing.	7188576	28, 57	62a, 64d-----	To remove or replace operating spring.
WRENCH, open end, fixed, charger tube coupling.	7188574	29	84a(3)-----	To remove charger cylinder cap.
WRENCH, spanner, face, recoil spring retainer.	7188572	30	84c(2)-----	To remove recoil spring retainer.
WRENCH, spanner, pin, gas cylinder plug.	7188579	31	73g(2), 75f(2)-	To remove gas cylinder plug.

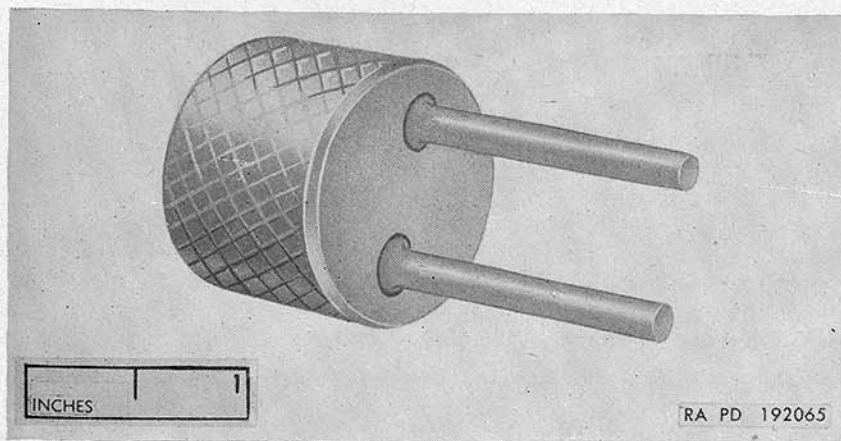


Figure 25. Drum shaft and barrel latches spring compressor—7188578.

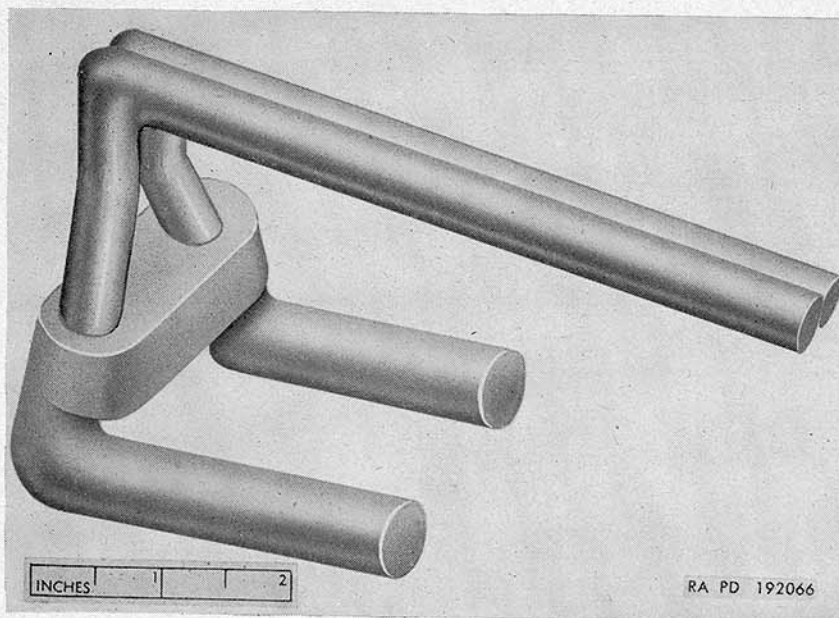


Figure 26. Drum lifting hook—7188573.

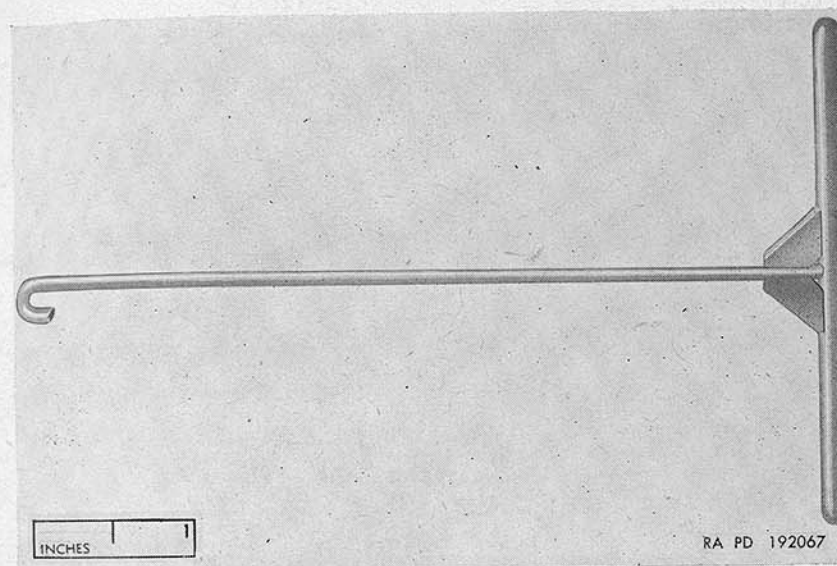


Figure 27. Rammer hook—7188569.

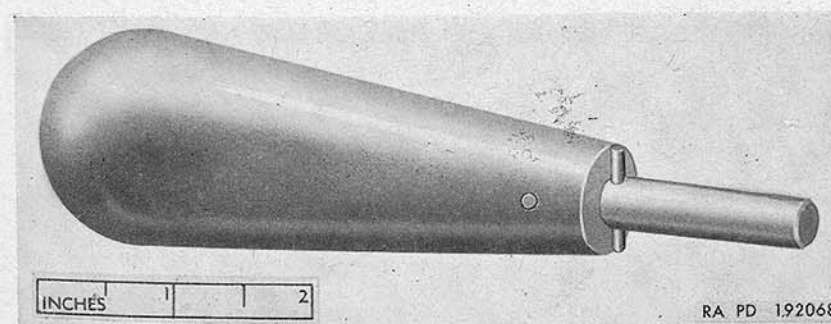


Figure 28. Removing or replacing operating spring tool—7188576.

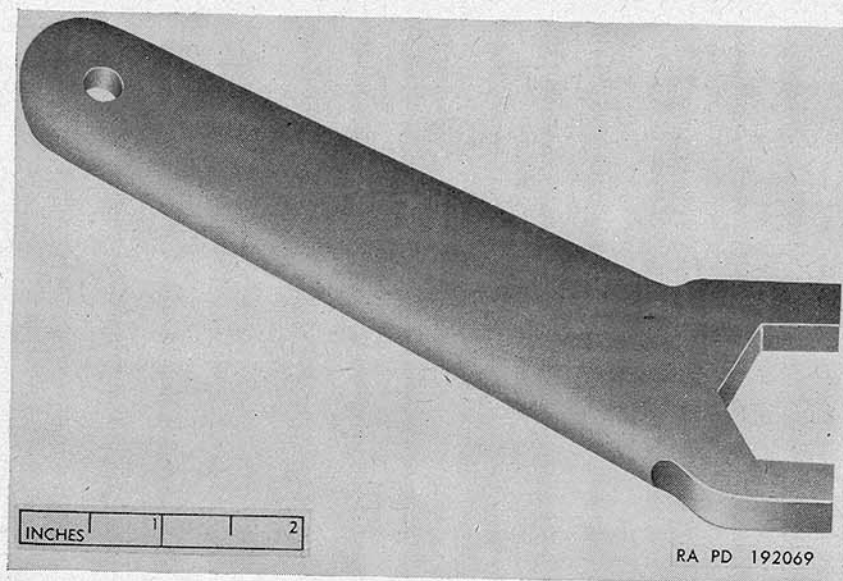


Figure 29. Charger tube coupling fixed open-end wrench—7188574.

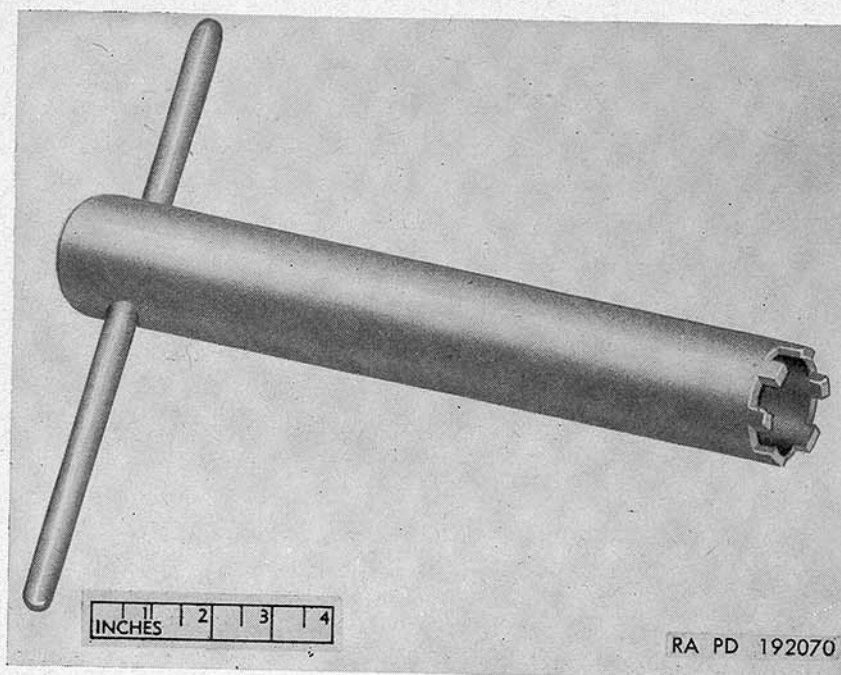


Figure 30. Recoil spring retainer face spanner wrench—7188572.

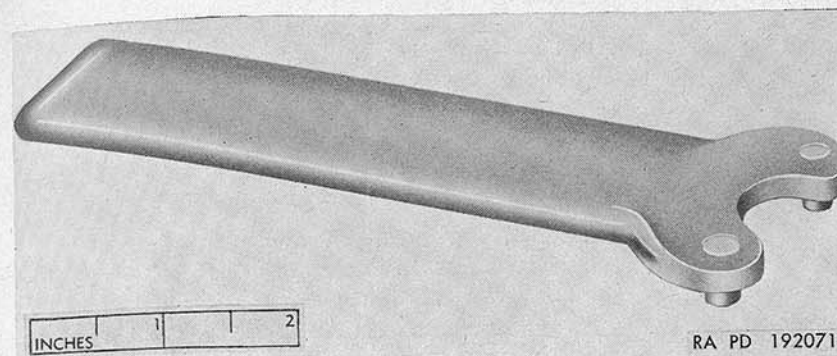


Figure 31. Gas cylinder plug pin spanner wrench—7188579.

Section II. LUBRICATION AND PREVENTIVE MAINTENANCE SERVICES

32. General Lubrication Instructions

a. Lubrication Chart. The lubrication chart prescribes organizational maintenance lubrication. In addition, it prescribes the lubricants to be used under various conditions.

LUBRICATION CHART

GUN, AUTOMATIC, 20-MM, T160
GUN, AUTOMATIC, CAL. .60, T130
References: TM 9-231A

FEEDER ASSEMBLY AND OPERATING SLIDE.	Each 60 days and after firing, clean with rifle-bore cleaner (CR), wipe dry, and oil with PL, medium above +32° F.; PL, special below +32° F. In humid and salt air areas, use PL, medium.
BORE AND DRUM CHAMBER-----	After firing, and on 3 consecutive days thereafter, clean with rifle-bore cleaner (CR). After 4th cleaning, dry and oil with PL, medium above +32° F.; PL, special below +32° F. Wipe clean before firing. When gun is not being fired, renew oil film each 60 days.
CHARGER CYLINDER AND GAS PASSAGE.	Each 60 days and after firing, clean with rifle-bore cleaner (CR), dry, and oil with PL, medium above +32° F.; PL, special below +32° F. In humid and salt air areas, use PL, medium.
CR-CLEANER, rifle-bore-----	PL-OIL, lubricating, preservative.

b. Lubrication.

- (1) Prior to flight, special preservative oil is used to lubricate the matériel. The oil prescribed insures proper functioning of the gun at all temperatures it is likely to be subjected to during flight.
- (2) Lubrication should be accomplished carefully and sparingly. All excess oil should be wiped from the gun. This is particularly important with regard to the operating slide, switch cam, and drum chamber. Oil or grease left in the chamber will raise the breech pressure to a hazardous point when the gun is fired and will result in excessive wear to the drum seal and breech face of the tube.
- (3) Excess oil holds grit and foreign matter blown on the gun, and as a result, may clog the recoiling parts causing a malfunction or stoppage. In any case, the abrasive action of the grit and foreign matter will cause excessive wear of the moving parts.
- (4) Smoking of the gun on firing might indicate excessive lubrication.
- (5) Remove excess oil from the bore and chamber of the barrel before firing or mounting guns for combat. The term lubrication as used in this manual applies both to lubricating moving contacting surfaces to minimize friction and to covering stationary parts with an oil film to prevent corrosion.

c. Cleaning Prior to Lubrication.

- (1) Prior to lubrication, all guns should be cleaned by one of the methods outlined in paragraph 8 or 9.
- (2) When cleaning the operating slide, switch cam, and drum, take care to completely remove all oil and residue from the components.

33. General

Preventive maintenance services prescribed by Air Force and Army regulations are a function of organizational unit armorers, and their performance is the responsibility of the armament officers of such organizations. These services consist generally of preflight, post-flight, and major services performed by organizational maintenance personnel. This section contains important general preventive maintenance procedures and specific maintenance procedures applying to the gun as a whole. Special maintenance for specific groups of the gun is covered, when necessary, in sections pertaining to the groups.

34. General Procedure

The following general procedure will be observed in addition to that referred to in the schedules listed in paragraph 36.

a. The importance of a thorough knowledge of how to clean and lubricate the matériel cannot be overemphasized. The kind of attention given this gun greatly determines whether the gun will shoot accurately and function properly when needed.

b. Rust, grit, dirt, gummed oil, and water cause rapid deterioration of all parts of the matériel. Particular care should be taken to keep all bearing surfaces and exposed parts clean and properly lubricated. Wiping cloths, riflebore cleaner, dry-cleaning solvent or volatile mineral spirits, and lubricants are furnished for this purpose. Remove all traces of rust from surfaces with crocus cloth.

c. Loose parts will be tightened; unserviceable parts replaced; and lock washers, safety wire, cotter pins, and other locking devices will be properly applied.

d. Do not dip or wash the recoil spring assembly or the operating springs in dry-cleaning solvent or volatile mineral spirits. These units are lubricated by the manufacturer, and if the special lubricant is diluted with dry-cleaning solvent or volatile mineral spirits, early failure of the units will result.

e. Spare parts, tools, and equipment will be inspected for completeness, serviceability, and interchangeability. Missing or damaged items will be replaced or turned in for repair. Use only tools that are provided and see that they fit properly. Tools that do not fit will fail or cause damage to parts.

f. At least every 6 months a check will be made to see that all technical orders have been applied. Check AF Form 185 for completeness. A list of current technical orders is published in TO No. 00-1-1 and TO No. 00-1-2. If a technical order has not been applied, the local armament officer will be promptly notified. No alteration or modification will be made except as authorized by official publications.

g. Each time the matériel is disassembled for cleaning or repair, carefully inspect all parts for cracks, excessive wear, rust, and like defects which might cause malfunction of the matériel. See paragraphs 37 through 49 of this chapter on malfunctions and corrections for information on certain parts, which when worn, damaged, or improperly adjusted cause definite malfunction. Use this section as a guide during inspection. Thoroughly clean and properly lubricate all parts before assembly.

35. Specific Procedures

- a. *Daily.* Inspect bore and chamber for rust.
- b. *Preflight or Before-firing Inspection.*
 - (1) Thoroughly clean the bore and drum chamber of all dirt, oil, or grease.
 - (2) Wipe outer surfaces of matériel with a clean wiping cloth dipped in proper oil and then wrung out.
- c. *Postflight or After-firing Inspection.*
 - (1) *Bore and drum chamber.* The following cleaning procedure is to be followed at the end of the day's firing. If no further firing is anticipated, it is to be repeated on 3 consecutive days thereafter.
 - (a) For cal. .60 bore, remove cal. .60 cleaning rod case 7161757 (table I, par. 31) and place two clean patches in the slot of the cal. .60 jointed cleaning rod 7161750; saturate the patch with rifle-bore cleaner, and move it back and forth through the tube several times. If rust, rust spots, and foreign matter are not removed by the bore cleaner, attach a cal. .60 cleaning brush 7161760 to the cleaning rod and run the brush through the tube several times. Make certain that the brush goes all the way through before reversing direction. A light coating of rifle-bore cleaner should be allowed to remain in the bore between cleanings to prevent rust. For the 20-mm barrel, use 20-mm bore brush M25 7225087 and 20-mm cleaning staff M13 5570631.
 - (b) After the fourth cleaning following firing, if no firing is anticipated in the next 24 hours, place clean dry patches in the slot of the cleaning rod and thoroughly dry bore and chamber. With clean patches wet with special preservative lubricating oil and well rung out, apply a light film of oil to the bore and chamber by working the patches through the barrel.

Note. Remove excess oil from bore and drum chamber if the matériel is to be fired.
 - (2) *Areas of a gun other than bore and chamber.*
 - (a) With rifle-bore cleaner, thoroughly clean all surfaces which have been exposed to powder gases.
 - (b) Dirt and foreign matter must be removed from all other parts. Thoroughly dry all components and immediately apply a light coat of special preservative lubricating oil.

Handle cleaned parts with gloved hands as acid from the hands accelerates rusting.

d. *Care of Spare Parts, Tools, and Equipment.* Remove dirt and foreign matter from all spare parts and tools. Dry thoroughly and apply a light coat of special preservative lubricating oil. Follow all above procedures where applicable in maintenance of spare parts and equipment.

36. Schedule of Preventive Maintenance

The items or points to be inspected and serviced at scheduled times are listed in table II with cross references to detailed instructions in other paragraphs in this manual.

Table II. Preventive Maintenance Schedule

Point	Preventive maintenance	Detailed instructions
<i>Preflight or before-firing</i>		
Gun as unit-----	Check for proper lubrication and cleanliness.	Par. 35.
Drum-----	Check drum indexing-----	Par. 41.
Ammunition belt-----	Check for proper loading and alinement.	Par. 19b.
Feeder assembly-----	Check to see that ammunition belt seats in guides and feedway.	Par. 19b.
Electric firing circuit-----	Check for connections to proper electric source.	Par. 38b.
Charger-----	Check for connections to 24-volt direct-current power source.	Par. 48b.
	Check loading-----	Par. 17b.
<i>Postflight or after-firing</i>		
Malfunctions or stoppage-----	Check for type-----	Par. 49b.
Gun as unit-----	Unload and record number of rounds fired.	Par. 21.
Drum chamber, bore, and all working parts.	Disassemble matériel, inspect, clean, and oil.	Par. 10.
Assembled gun-----	With operating springs removed, cycle operating slide to insure drum indexing.	Par. 19b(4).
Charger-----	Unload-----	Par. 17b.
	Remove from gun; clean cylinder and gas passageway.	Pars. 88 and 89.

Section III. CYCLIC FUNCTIONING AND TROUBLE SHOOTING

37. General

a. Each time a cartridge is fired, the mechanical action within the gun involves many parts moving simultaneously or in their proper order. The action of these parts and their relationship, one to the other, can be explained more clearly when one cycle of operation is divided into various phases. These phases will be explained in paragraphs 38 through 47 of this section in order indicated in *b* below. Familiarity with the construction of the gun and function of its component parts and groups, as explained in sections pertaining to the groups, is necessary for a thorough understanding of the cyclic functioning of the gun as a whole. It will aid in understanding cyclic functioning if the gun is hand-operated using dummy ammunition.

b. For convenience and clarity, the cycle of operation is divided into the following phases and explained in the order indicated:

FIRING
GAS ACTION
RECOIL AND COUNTERRECOIL
DRUM INDEXING
BREAKING ELECTRIC CIRCUIT
RAMMING AND ROUND RETAINING ACTION
INDEXING TO FIRING POSITION
EXTRACTION
ANTIDOUBLE FREED ACTION
FEEDING

38. Firing

a. The drum of a gun (fig. 32) which is ready to fire has been charged the necessary three times (par. 19b(4) and (5)) and contains three rounds: one fully chambered, ready to fire, at the 6-o'clock position, in line with the tube bore; one round which is completely chambered ready to be indexed to the 6-o'clock position for firing; and one round rammed from its link in the feeder and partially entering the alined chamber of the drum. The two chambers before the 6-o'clock position are empty.

b. In order to fire, the operating slide must be in battery (completely forward) and the firing circuit complete. The firing circuit connector (fig. 4) must be connected to a 200-volt direct-current source.

c. When the chambered round is in the 6-o'clock position, its forward end seats in the drum seal, while the primer, at the rear of the cartridge, is in contact with the firing pin (fig. 33). The firing pin and anvil assembly supports the case of the cartridge during firing. The chambered cartridge protrudes from the rear face of the drum a slight amount, making the groove (figs. 32 and 33) around the base of the round visible.

d. When the firing switch is depressed, current flows through the firing circuit and firing pin to the primer, exploding the cartridge.

39. Gas Action

a. The propellant gas expands in the drum chamber and tube (fig. 33) as the projectile travels forward. After the projectile passes the tube orifice, a portion of the gas is bled into the tube orifice, then through the receiver orifice into the gas tube adapter. The gas tube adapter is drilled with two connecting right angle holes and joins the vertical receiver orifice to the horizontal gas tube.

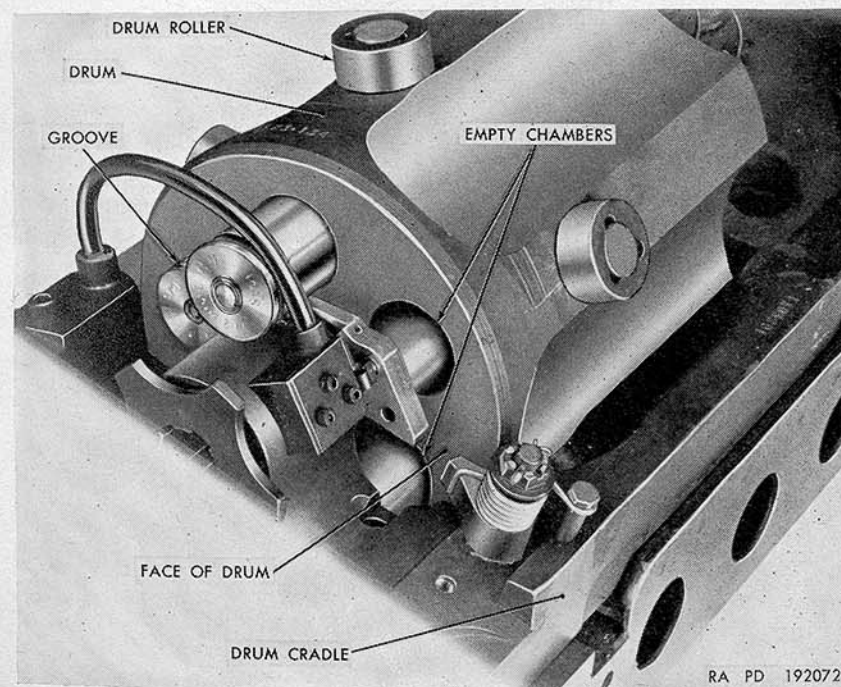


Figure 32. Empty chambers in drum.

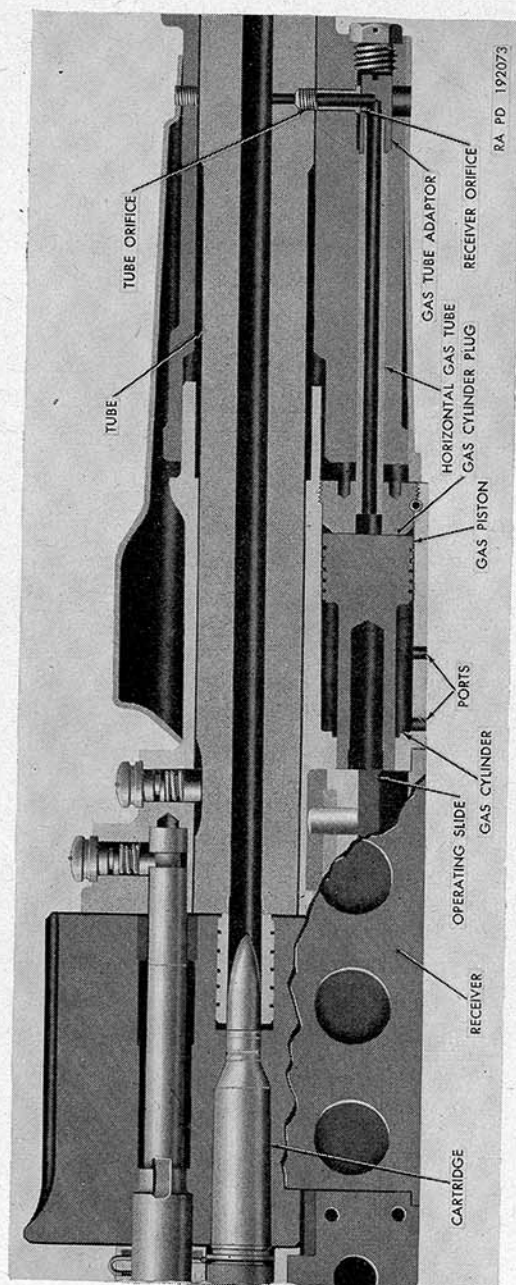


Figure 33. Cutaway section of gun.

b. The gas tube enters the gas cylinder of the cradle, which is a recoiling part, through the gas cylinder plug (fig. 33). Adequate clearance is provided between the hole in the gas cylinder plug and the gas tube to permit relative motion between the recoiling gas cylinder (in cradle) and stationary gas tube.

c. The propellant gases in the gas cylinder (fig. 33) force the gas piston rearward, and the operating slide is moved backward by the gas piston shaft.

d. Leakage of gas past the gas piston is minimized by circular grooves around the piston head.

e. Two ports (fig. 33), which extend into the gas cylinder, are machined into the bottom of the drum cradle. The rear port allows entrapped air to be expelled as the piston is forced rearward, and the forward port acts as an exhaust for the operating gases after the piston has completed its rearward motion.

40. Recoil and Counterrecoil

a. The recoil forces developed upon firing act directly upon the drum cradle (fig. 32), forcing it rearward. The barrel assembly, drum assembly, and drum cradle group constitute the recoiling parts of the weapon.

b. Two recoil spring assemblies housed in the receiver, one on each side of the barrel, absorb and limit the recoil of the drum cradle group to one-quarter of an inch. The recoil springs seat against a shoulder in the receiver. The recoil spring shafts extend through two yokes on the drum cradle and are locked in place by a threaded nut and washer. Recoil forces acting rearward are transmitted to the recoil spring shafts and cause the recoil springs to compress, absorbing the recoil force.

c. The other end of the recoil springs bear against retainers screwed into the front face of the receiver. There can be no free movement of the recoiling parts, in either direction, without compression of the recoil springs. The springs are double-acting and therefore limit the counterrecoil forces as well as the recoil forces.

41. Drum Indexing

a. The rotational motion of the drum assembly, necessary for indexing the rounds from station to station, is derived by the action between the drum rollers (fig. 32) and the cam path of the operating slide (fig. 9).

b. Machined into the operating slide are two cam paths which guide the drum rollers. The two cam paths parallel each other, then turn away from each other on a curve (fig. 9).

c. Mounted between the two cam paths is the switch tongue (fig. 9). The position of this tongue determines which cam path the drum roller will follow.

d. The switch tongue is moved at the proper time and to the proper side by the switch cam. This cam (fig. 12) is located beneath the operating slide and is attached to the drum cradle. It recoils in unison with the drum cradle.

e. When the gun is ready to fire, the operating slide is in its forward position, the switch tongue is on the left side, and a drum roller is engaged by the straight portion of the cam path. When the round is fired, the operating slide is driven rearward. The drum roller follows the cam path of the slide.

f. As long as the drum roller engages the straight portion of the cam path, the drum does not rotate. This keeps the drum stationary for the first 2 inches of rearward travel of the operating slide, maintaining alinement of the drum chamber with the tube while the projectile is moving out the bore.

g. With the switch tongue to the left, the drum roller is forced to follow the cam path curve to the right. This rotates the drum in a counterclockwise direction.

h. At the time the active roller clears the right side cam path, the adjacent roller has been rotated by the drum into a position where it enters the cam path on the left side. At the same time, the switch tongue is cammed to the right to permit the entering roller to move on into the straight portion of the cam path as the operating slide is returned to battery position. To complete the cycle, the switch tongue is cammed to its left position again, after the drum roller has entered the straight portion of the cam path.

42. Breaking Electric Circuit

a. When the operating slide is driven rearward, the contact blade assembly (fig. 9) attached to the operating slide is withdrawn from the female contact of the firing circuit below the drum cradle. This action breaks the electric circuit, and prevents current from flowing in the circuit until contact is made by the blade when the slide returns to battery.

b. If the circuit were complete, a round could be fired prematurely as its edge contacts the electrically energized firing pin as the round is brought into firing position.

43. Ramming and Round Retaining Action

a. Ramming is accomplished in two stages by means of a rammer (fig. 34) which is attached to the operating slide.

b. The first stage occurs upon firing. The operating slide is driven rearward, and the drum's indexing positions an empty drum chamber in the path of upper ramming face. As the slide returns to battery, the upper ramming face contacts the base of the positioned cartridge in the feeder, pushing the cartridge from its link and partially seating the round in the alined drum chamber (fig. 34).

c. As the next round is fired, the drum indexes again and rotates the previously partially chambered round into the path of the lower ramming face (fig. 34). The lower ramming face drives this round into the chamber. At the same time the upper ramming face is extracting another round from its link.

d. As the round is being chambered by the lower rammer face, it passes over and depresses the spring-loaded round retainer (fig. 34), positioned on the rear of the drum cradle. After the round has passed over the round retainer, the round retainer snaps upward and bears against the base of the completely chambered round, holding it in position.

44. Indexing to Firing Position

a. When the drum indexes again, upon firing of a round, the round that had been held by the round retainer (fig. 34), moves to the battery position (6-o'clock) where it is in alinement with the tube bore and the firing pin (fig. 33).

b. As the round is brought across the face of the firing pin anvil (fig. 10), the cartridge strikes the edge of the protruding firing pin and moves the firing pin into the anvil, compressing the firing pin spring. When the round is properly located in the 6-o'clock position, the firing pin contacts the primer of the cartridge.

45. Extraction

a. After being fired, the cartridge case is indexed into position for extraction (fig. 35). When the cartridge case is indexed, the rear groove extends outward from the drum where it is engaged by the extractor.

b. The extractor is operated by the striker (fig. 9) as the operating slide to which the striker is attached, approaches battery position. As the slide comes into battery and the next roller enters the straight

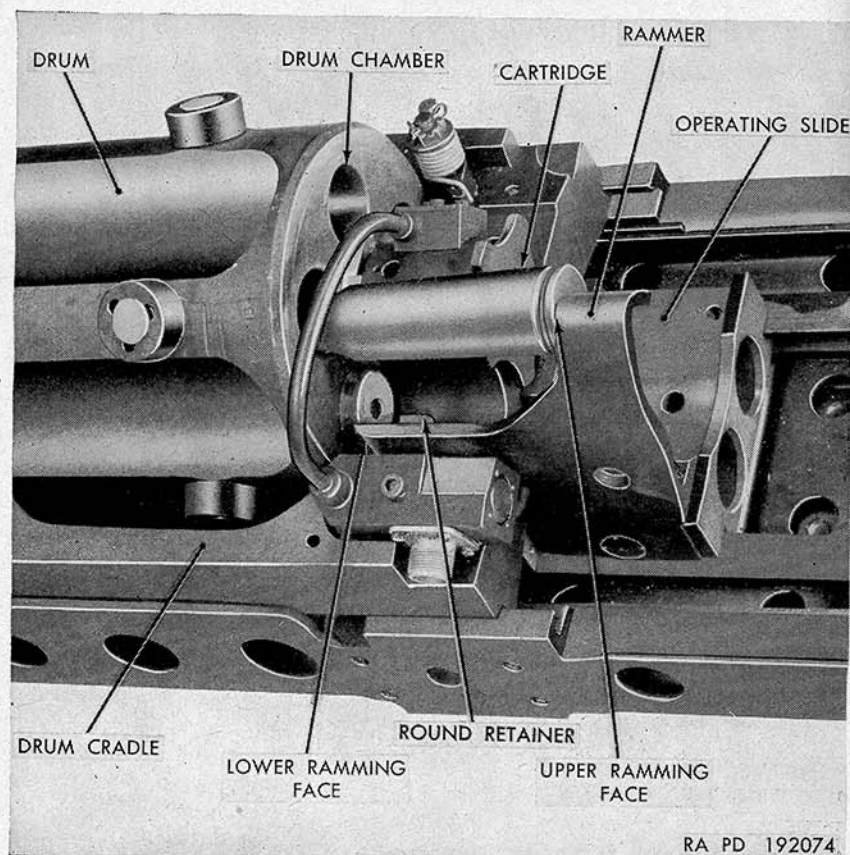


Figure 34. Ramming action of gun.

portion of the cam path, the drum ceases to rotate. It is at this point, about one and three-quarters of an inch out of battery, that extraction takes place.

c. At this point, the striker hits a cam (fig. 36) on the lower end of the extractor shaft (fig. 35). This action causes the extractor, splined to the upper end of the shaft, to rotate. The rotation of the extractor (fig. 37) pulls the cartridge case from the chamber, forcing it down the case ejection chute (fig. 3). The slide continues into battery position and the striker holds the extractor in the retracted position.

d. The striker releases the extractor when the operating slide returns rearward. The extractor cam (fig. 9) attached to the operating slide rotates the extractor back to its original position, bearing against the drum face.

46. Antidouble Feed Action

a. This gun is equipped with an antidouble feed safety device (fig. 35) which prevents subsequent firing of a new round, in the event a cartridge case is not extracted with enough energy to clear the drum chamber.

b. The pawl (fig. 37) of the antidouble feed device pivots on the drum shaft and has a male contact (fig. 35) which engages a female contact on the firing circuit assembled to the drum cradle. The pawl of the antidouble feed device extends into the path of the cartridge case being indexed into extraction position. As the cartridge case enters the extraction position, it hits the pawl and rotates it upward. This separates the two contacts, breaking the electric circuit. When the case is extracted, the antidouble feed spring (par. 73a) returns the pawl to its original position, once again completing the electric circuit.

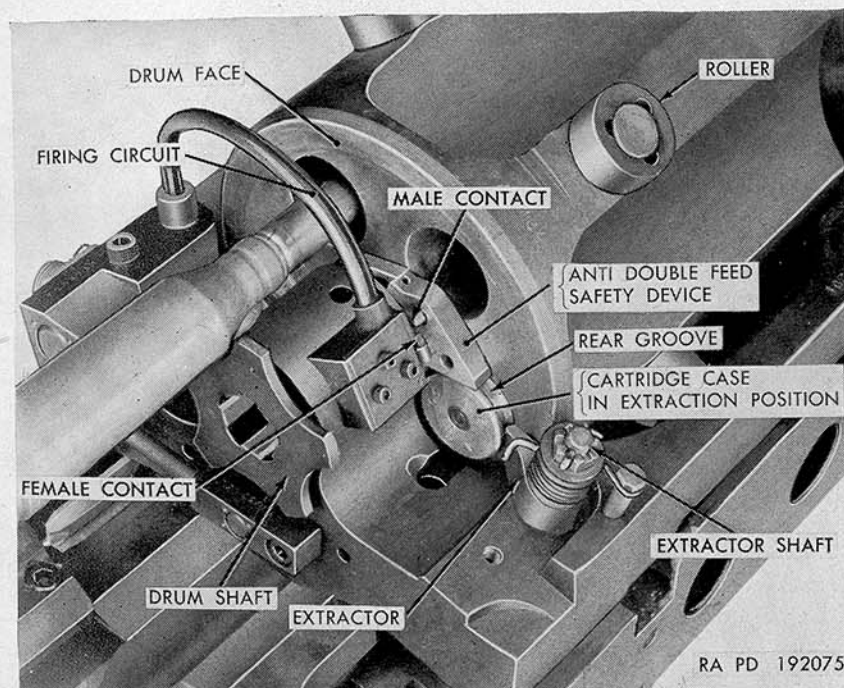
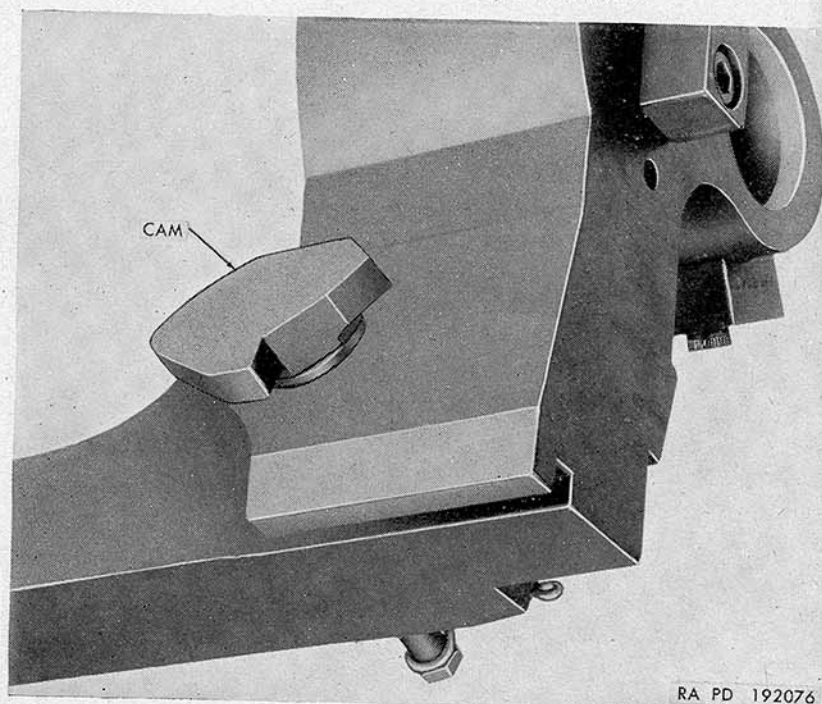


Figure 35. Cartridge case indexed for extraction.



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Figure 36. Cam on extractor shaft.

47. Feeding

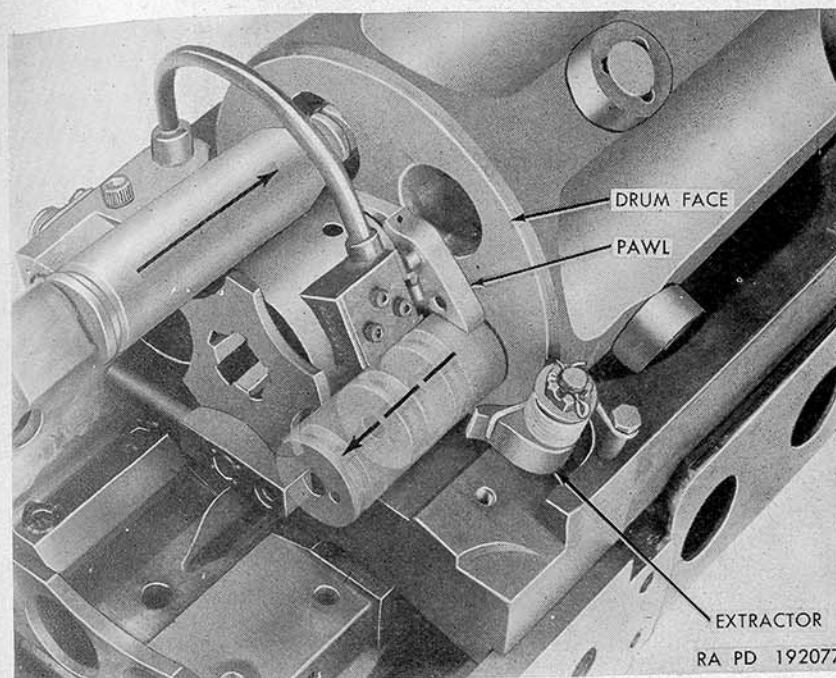
a. The feeder assembly (fig. 22) on this weapon is the disintegrating link type. It positions the round for ramming, ejects the empty links, and deflects the extracted cases as they are forced rearward.

b. All the moving members of the feeder are mounted on the feeder shaft. The feeder shaft is attached to the drum, and cycles with it.

c. The ammunition belt enters the feed mouth at the top of the feeder at an angle of 25° above the horizontal where it is engaged by sprockets.

d. The round is positioned in alinement with the drum chamber. The rammer attached to the operating slide contacts the base of the positioned cartridge, pushing the cartridge from its link.

e. After ramming, the empty links continue around the sprockets and leave the feeder through an opening. As soon as an empty link leaves the feeder, it separates from the one directly behind it, which is about to leave the feeder. Ejected empty links no longer form a belt.



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Figure 37. Cartridge case being extracted.

48. Functioning of Percussion Charger T13

a. General. The percussion charger T13 is used to cycle the gun in anticipation of initial firing. The cylinder of the charger is chambered to take the cal. .30 carbine grenade cartridge M6. Firing this cartridge develops sufficient gas pressure to cycle the gun once. The charger mechanism is actuated by a 24-volt direct-current source applied to the charger solenoid (fig. 38). The following phases of operation of the charger are described in the order indicated:

Application of the current.

Cylinder unlocking action.

Cylinder indexing action.

Cylinder locking action.

Firing action.

Cessation of current.

b. Application of the Current. When current from a 24-volt direct-current source is applied to the solenoid of the charger (fig. 38), through the connector (fig. 13), the armature is drawn into the coil, compressing the armature spring.

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c. Cylinder Unlocking Action. As the armature is being pulled rearward, the cylinder index lock lever (figs. 38 and 39) pivots about the hammer pivot, forcing the cam end of the cylinder index lock downward. This raises the forward end of the cylinder index lock from the locking groove of the cylinder, unlocking the cylinder.

d. Cylinder Indexing Action. At the same time the cylinder index lock lever (fig. 38) is being pivoted, the indexing pawl lever is undergoing the same action on the opposite side of the charger (fig. 40). As the armature (fig. 38) is being pulled rearward, the indexing pawl lever is rotated clockwise about hammer pivot. The pivoting of the indexing pawl lever moves the indexing pawl pivot downward. The pawl spring applies a rotary force to the indexing pawl, which pivots on the indexing pawl pivot. The pawl cam prevents the pawl spring from rotating the indexing pawl forward; therefore, the pawl bears against the cam at all times. As the pawl pivot moves downward, the recessed portion of the pawl comes into contact with the pawl cam. This allows the pawl spring to move the pawl outward from the frame (fig. 41). Continued motion of the pawl lever causes the pivot to move straight downward. Just as the pawl is exposed from the frame, it engages the ratchet (fig. 38) on the rear of the charger cylinder. The downward stroke of the pawl causes the cylinder to index one chamber. This indexing action takes place just after the index lock (fig. 38) has been lifted from the cylinder.

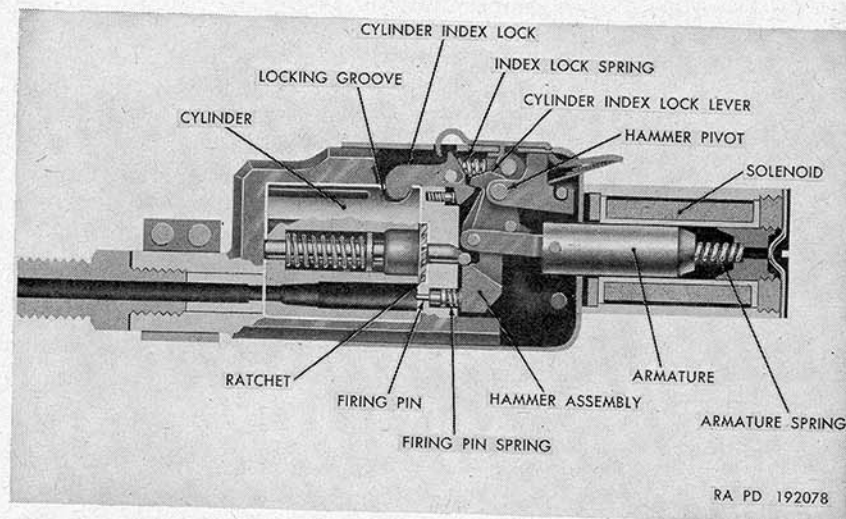


Figure 38. Cross-section view of charger.

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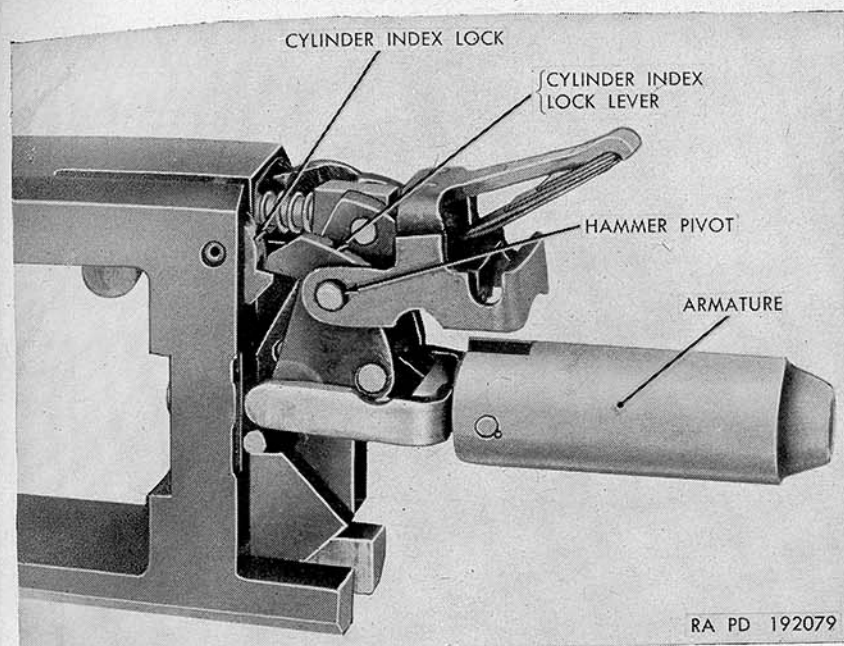


Figure 39. Charger cylinder unlocking action—cylinder removed.

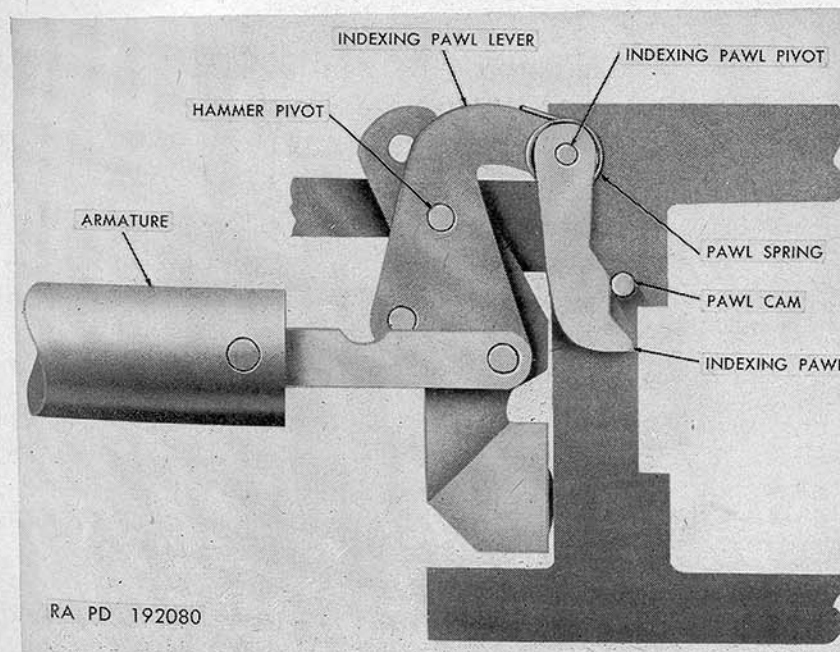
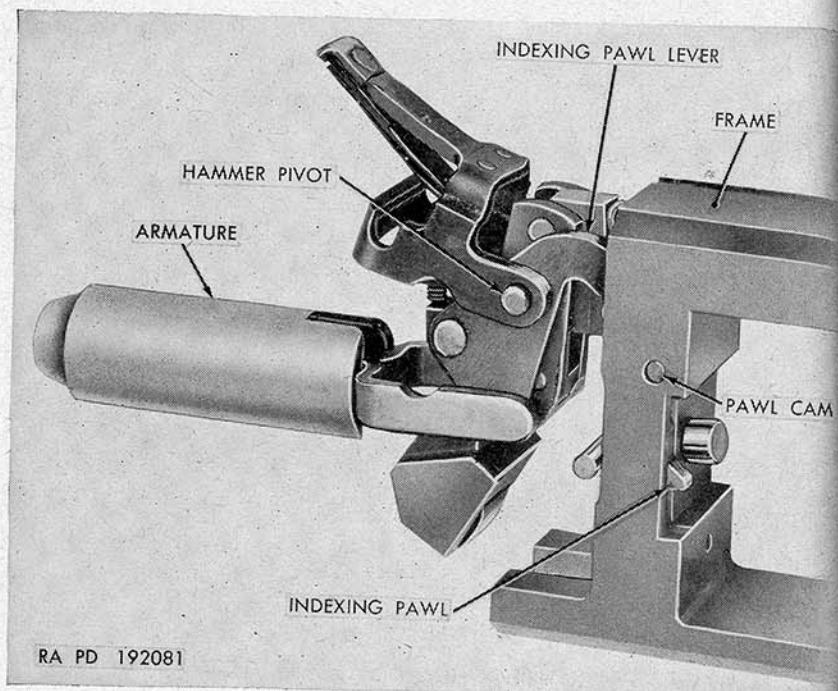


Figure 40. Pawl cam action.



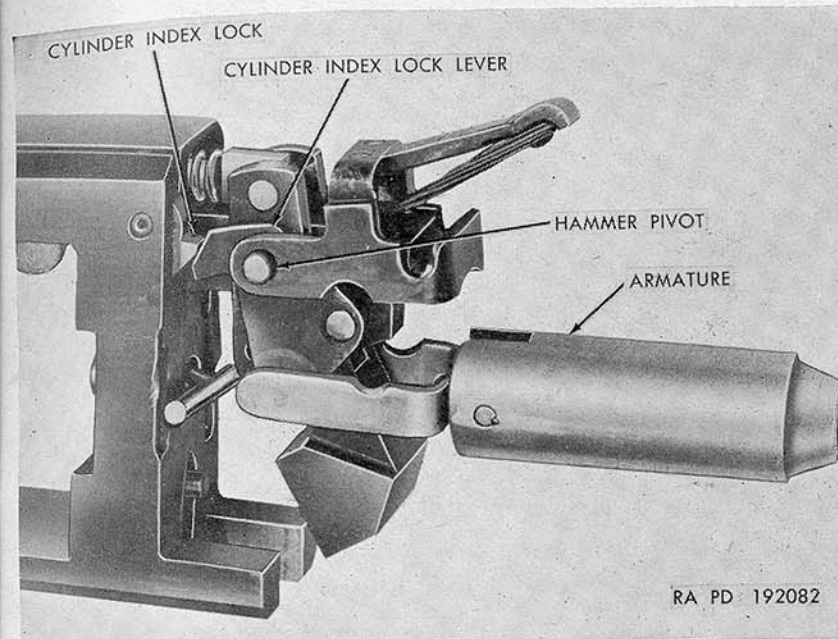
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Figure 41. Charger cylinder indexing action—cylinder removed.

e. Cylinder Locking Action. Continued rearward movement of the armature brings the beveled cam edge of the cylinder index lock lever in contact with the index lock (fig. 42). This allows the lock to snap past the index lock lever and be returned to its locked position by the index lock spring (fig. 38). This prevents the cylinder from rotating after the cartridge is in line with the firing pin.

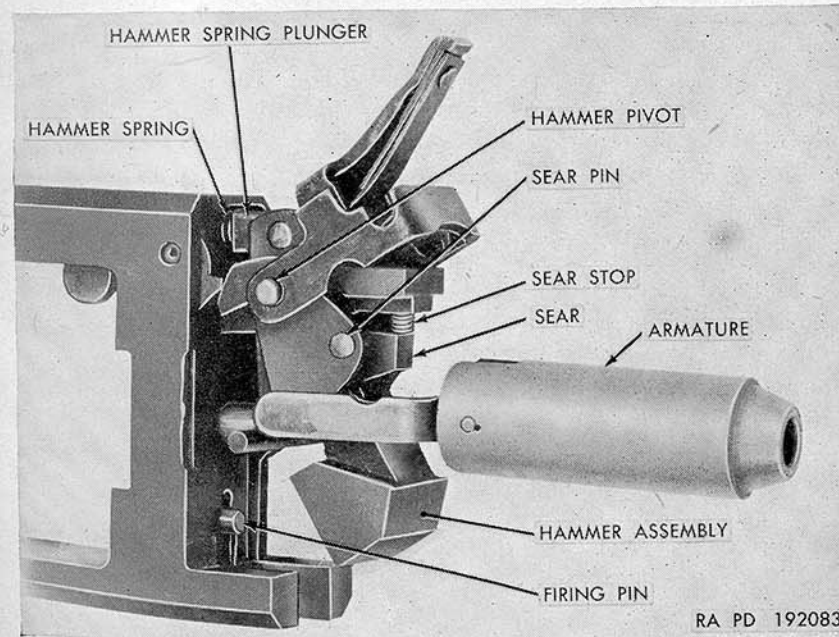
f. Firing action. When the armature starts rearward, the hammer assembly is pulled rearward by the sear pin (fig. 43) which engages the sear. After the cylinder has indexed and been relocked in firing position, the sear contacts the sear stop which forces the sear off the sear pin. The hammer spring and plunger, which were being compressed as the armature moved rearward, drive the freed hammer assembly into the firing pin (figs. 43 and 44) by rotating it about the hammer pivot. The firing pin is then driven inward, compressing the firing pin spring (fig. 38), and firing the cartridge.

g. Cessation of current. When the current is stopped, the compressed armature spring (fig. 38) drives the armature out of the solenoid. This returns the cylinder index lock lever and the indexing pawl lever to their original positions. The index pawl (fig. 41)



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Figure 42. Cylinder locking action—cylinder removed.



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Figure 43. Cocking and sear release.

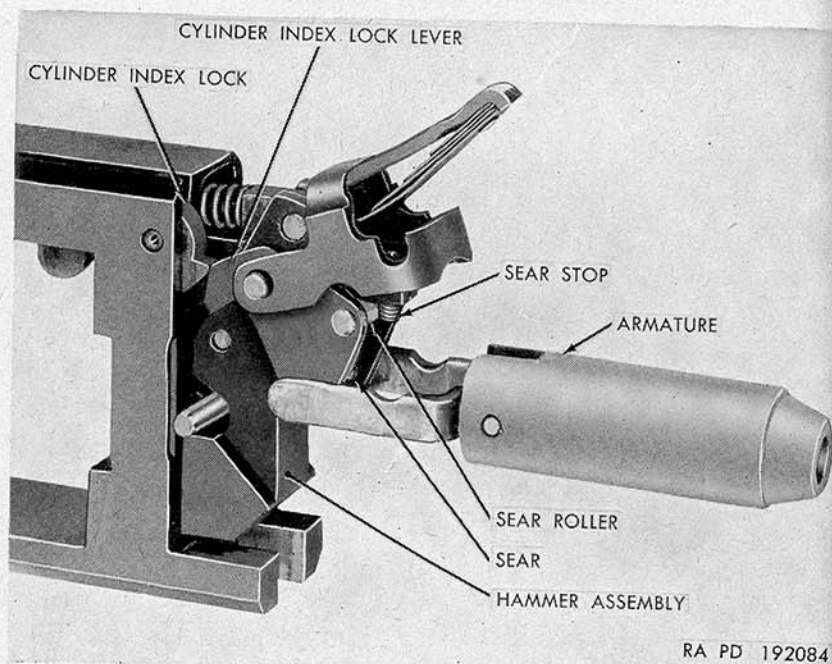


Figure 44. Charger after sear release and before armature return.

returns with the pawl lever. The sear roller forces the sear down against the sear plunger and spring and passes over the sear. When the sear roller passes over the sear, its sear spring returns the sear upward to contact the sear roller again.

49. General

a. It is important that the gun and all its equipment be properly installed and maintained. Proper care of the gun and proper maintenance schedules (par. 36) will greatly reduce the possibility of gun stoppage due to malfunction of the matériel. When trouble develops, equipment should be carefully checked before assuming the gun itself is responsible for the stoppage.

b. Most common malfunctions fall into the categories listed in table III.

Table III. Trouble Shooting

Malfunction	Probable causes	Corrective action
Failure to fire chambered round.	Faulty ammunition-----	Recharge and extract round (par. 20c).
	Failure of external power source.	Check connection to firing circuit connector on firing circuit (par. 3i).
	Firing pin stuck in anvil--	Replace the anvil w/firing pin assembly (par. 73d).
	Round is chambered too far.	Recharge and extract round (par. 20c).
	Failure of contact blade of slide to engage firing circuit contact.	Notify maintenance personnel.
Premature firing-----	Failure of antidouble feed contact to reengage contact of firing circuit.	Notify maintenance personnel.
	Contacts under drum cradle become shorted.	Notify maintenance personnel for circuit replacement.
Failure to extract-----	Weak extractor spring and worn extractor cam on operating slide.	Replace extractor spring (par. 73e) and cam (par. 79h).
	Worn extractor-----	Replace extractor (par. 73e).
Failure to cycle-----	Jam of ammunition in feeder.	Remove ammunition belt from feeder to clear (par. 21).
	Excessive gas leakage----	Replace barrel assembly (par. 51) or seals (par. 67).

Section IV. BARREL ASSEMBLY

50. General

The barrel assembly (figs. 3 and 4) is a recoiling component of the gun and consists of the tube and orifice. It extends through the forward end of the receiver and drum cradle to the forward face of the drum assembly. It is supported at two points, one by a close fitting bore in the drum cradle and the other by a similar bore at the forward end of the receiver. The barrel assembly is retained in the drum cradle by interrupted threads. These threads offset the force exerted on the breech face of the tube by the drum seals and the forward frictional

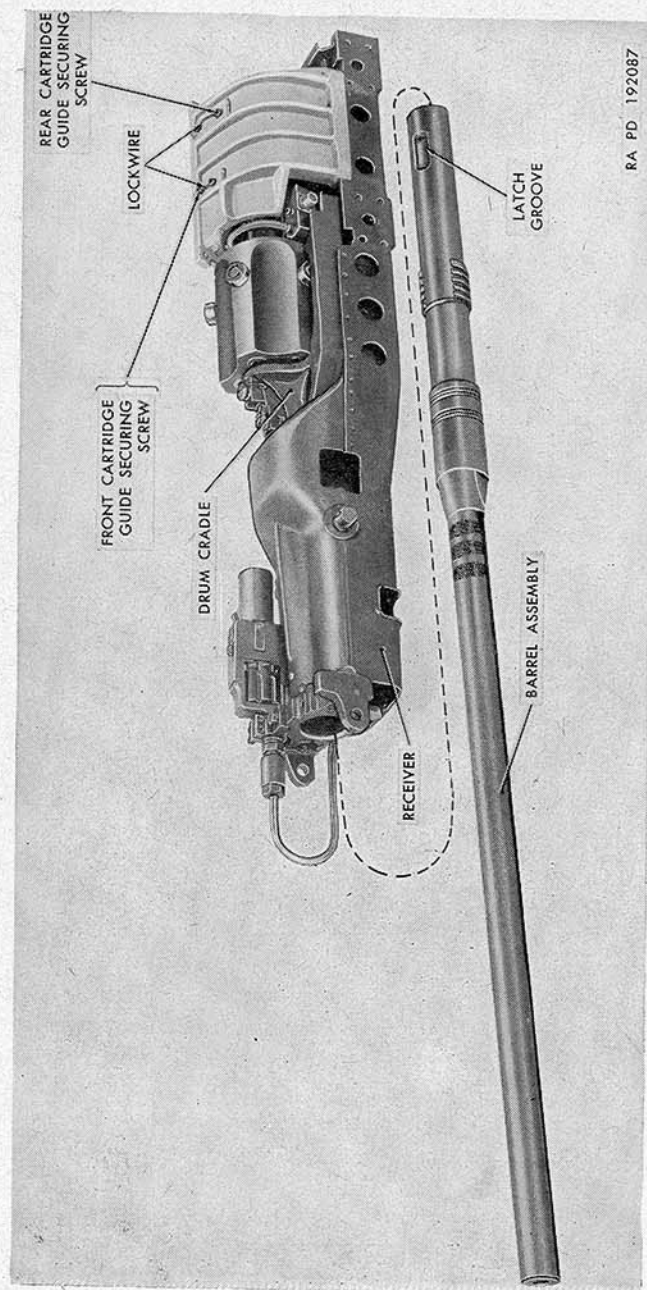


Figure 47. Barrel assembly removed from receiver and drum cradle.

e. Check breech face of tube for possible gas erosion (fig. 49) caused by faulty drum seals. If such a condition exists replace barrel and examine drum seals (par. 68).

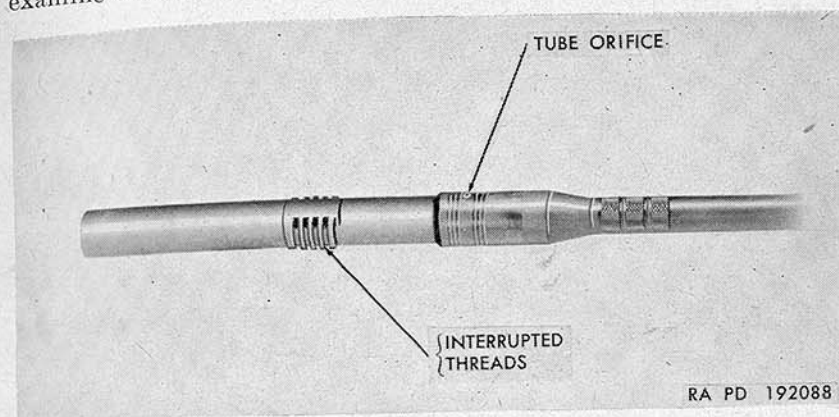


Figure 48. Tube orifice and interrupted threads of barrel assembly.

f. Check the interrupted threads (fig. 48) for burrs. Remove burrs with crocus cloth or fine oilstone. Burred threads will hamper installation of barrel assembly in drum cradle.

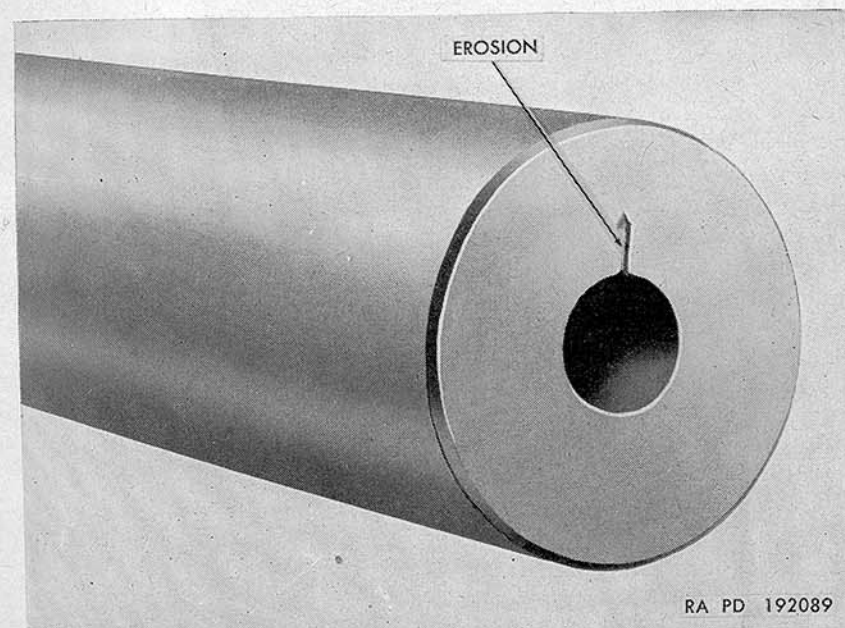


Figure 49. Erosion of breech face of tube caused by defective drum seals.

54. Installation

- Insert breech end of barrel assembly into the hole provided at the forward end of the receiver. Be sure that the interrupted threads are vertical and the latch groove (fig. 47) is to the left (looking at receiver from forward end).
- Lift the barrel latch assembly (fig. 46) and move barrel assembly into cradle as far as possible. Proceed slowly to prevent striking and burring the threads.
- Release the barrel latch assembly.
- Rotate the barrel assembly 90° clockwise (looking toward rear of gun) until the barrel latch assembly engages the latch groove of the tube (fig. 47), locking the barrel assembly in place.
- Position the barrel latch retainer in the groove of the barrel latch assembly head, and lock the barrel latch retainer in place by forcing the projection on the latch lock (fig. 45) under the latch lock pin.

Section V. FEEDER ASSEMBLY

55. General

- The feeder assembly (fig. 3), supplied with the gun, serves several functions. It positions the rounds of the ammunition belt in the path of the rammer and aligns the round with the chamber of the drum assembly (par. 47). Also, it deflects the extracted cartridges away from the gun and ejects the empty links (par. 47).
- Both a left-hand and a right-hand feeder (fig. 11) are available for issue with the gun. By changing the forward cartridge guide (par. 15c) the feeders may be converted for operation with either 20-mm or cal. .60 ammunition.
- The feeder shaft is under direct action from the drum assembly, by being splined to the drum shaft (fig. 35). Each of the elements mounted on the feeder shaft has a specific function in feeding the round for chambering.

56. Removal

- Lift feeder shaft latch (fig. 50) and withdraw feeder shaft rearward as far as possible. Withdraw feeder shaft from drum shaft.
- Lift feeder lock handles (fig. 51) to disengage feeder lock plungers from the receiver. Rotate lock handle towards the feeder shaft to retain lock plungers upwards.

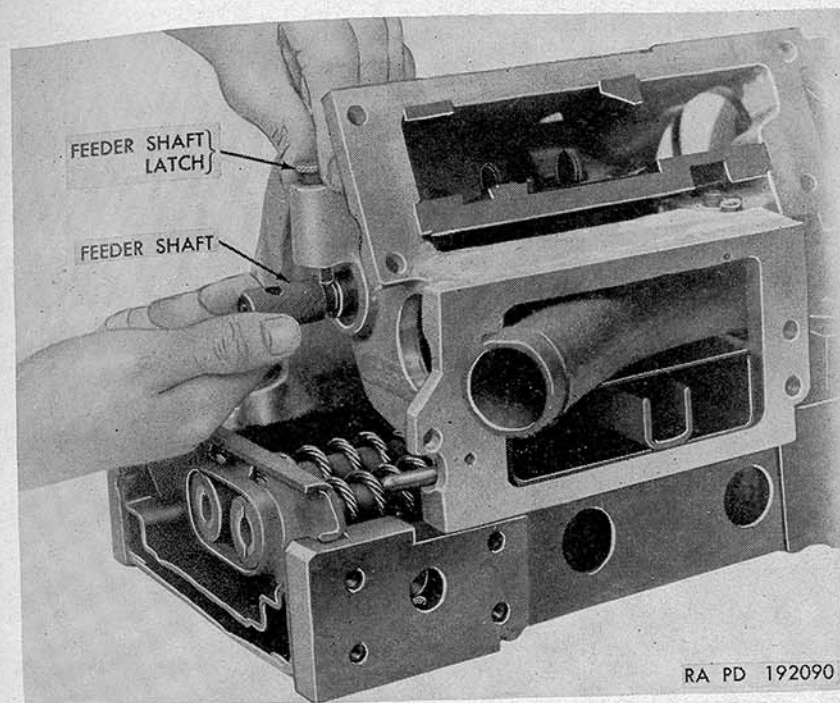


Figure 50. Withdrawing feeder shaft from drum shaft.

- Pull feeder assembly (fig. 52) to rear until feeder locating pins are clear of receiver "L" slots.
- Lift feeder assembly from receiver (fig. 52), being sure that the rammer of the operating slide does not interfere with the feeder sprockets.

57. Disassembly

- Break the lockwires that secure the front and rear cartridge guide screws (fig. 47), and front and rear case ejection chute screws (fig. 53).
- Remove front and rear cartridge guides by unscrewing the front and rear cartridge guide securing screws.
- Remove the front and rear case ejection chute securing screws.
- Lift feeder shaft latch (fig. 53) and push feed shaft toward forward end of feeder. The elements of the feeder shaft (fig. 54) will fall out the bottom of the feeder frame.
- Break lockwire and unscrew the four center guide screws (fig. 55) that secure the center guide to the feeder frame.

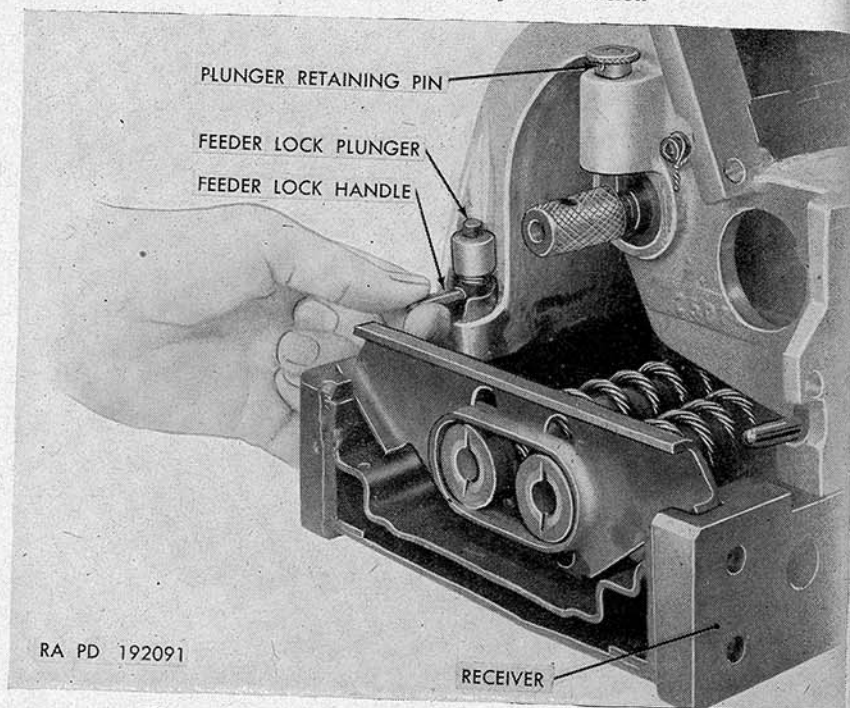


Figure 51. Unlocking feeder mechanism from receiver.

f. Pull center guide (fig. 55) outward to free center guide from the center guide grooves of the frame, lift slightly, and withdraw from frame.

g. Withdraw link ejection chute, rotating its outward end slightly to clear the rear projections.

h. Disassemble the feeder shaft latch by driving out the plunger retaining pin (fig. 51). This frees the feeder shaft lock plunger, the lock plunger spring, and the lock plunger knob (fig. 56).

i. Disassemble the feeder lock by driving out the handle retaining pin (fig. 56). To do this, it is necessary to align the pin with the access hole provided in the feeder frame, and hold the lock handle upward against the spring's action.

j. After pin is driven out, withdraw the feeder lock handle (fig. 56) from the lock plunger. Be sure to hold the lock plunger inward until the handle is withdrawn and then release the plunger slowly or the spring will drive the plunger out rapidly.

k. Remove the lock plunger and lock plunger spring.

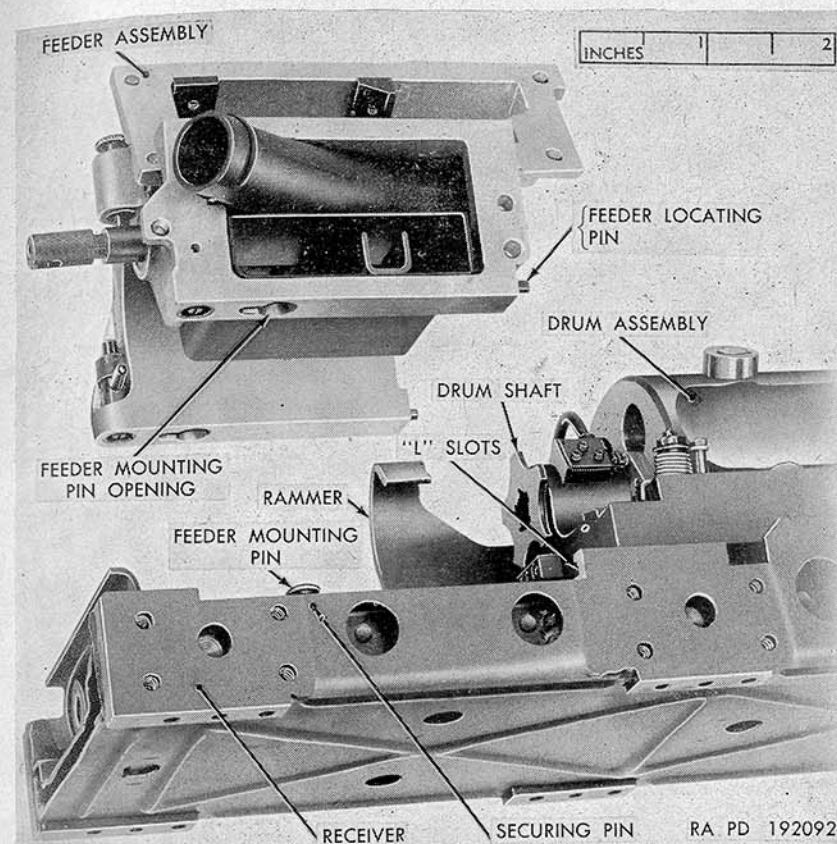


Figure 52. Feeder assembly removed from receiver.

l. Repeat operations for the second feeder lock.

m. Further disassembly of the feeder frame is prohibited on the organizational level of maintenance.

58. Maintenance

a. Clean and lubricate all components as directed in paragraph 32.

b. Check the splines of the feeder shaft elements (fig. 54) and the splines on the feeder shaft. Remove burs or rough spots with crocus cloth or fine oilstone.

c. Check front and rear guide tracks for burs on the link tab paths (fig. 53). This path must be clear of obstruction or jamming of the ammunition belt and failure to feed may result.

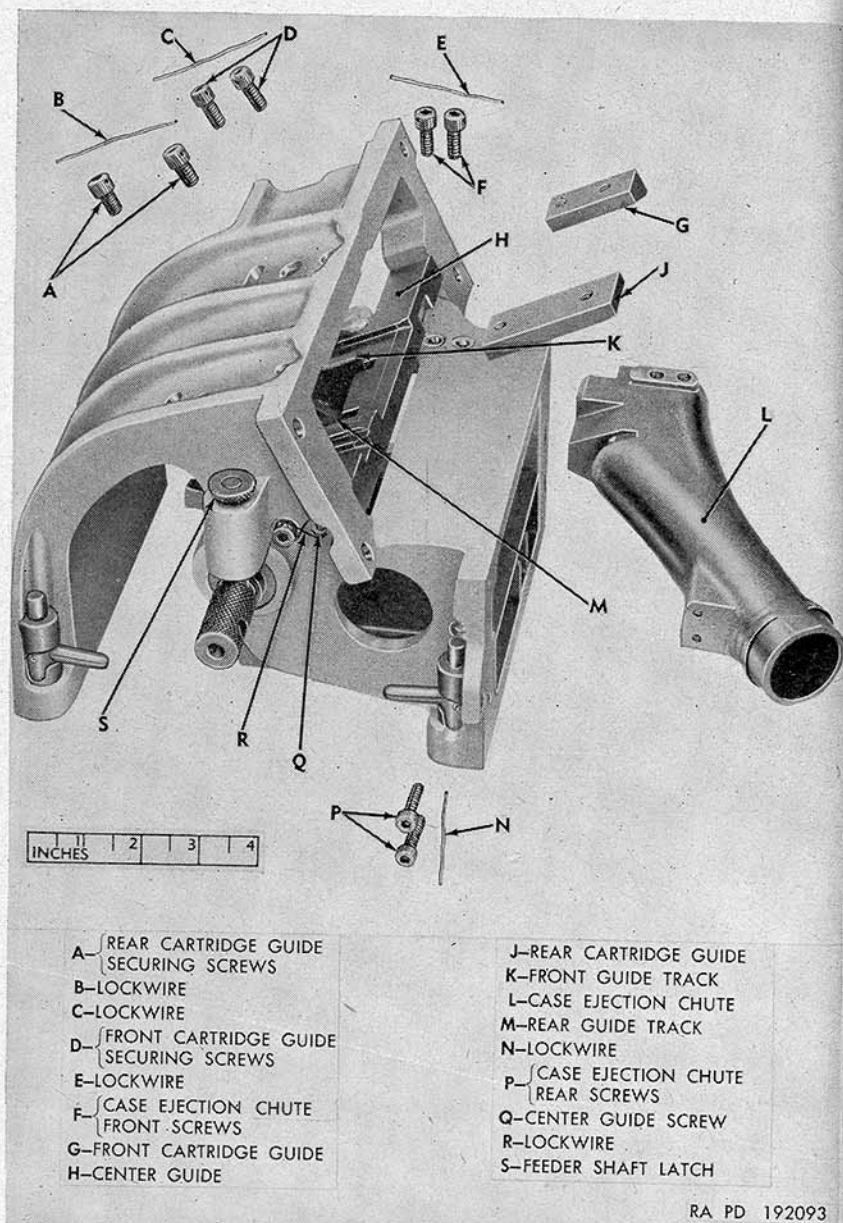


Figure 53. Cartridge guides and case ejection chute removed from a right-hand feeder assembly.

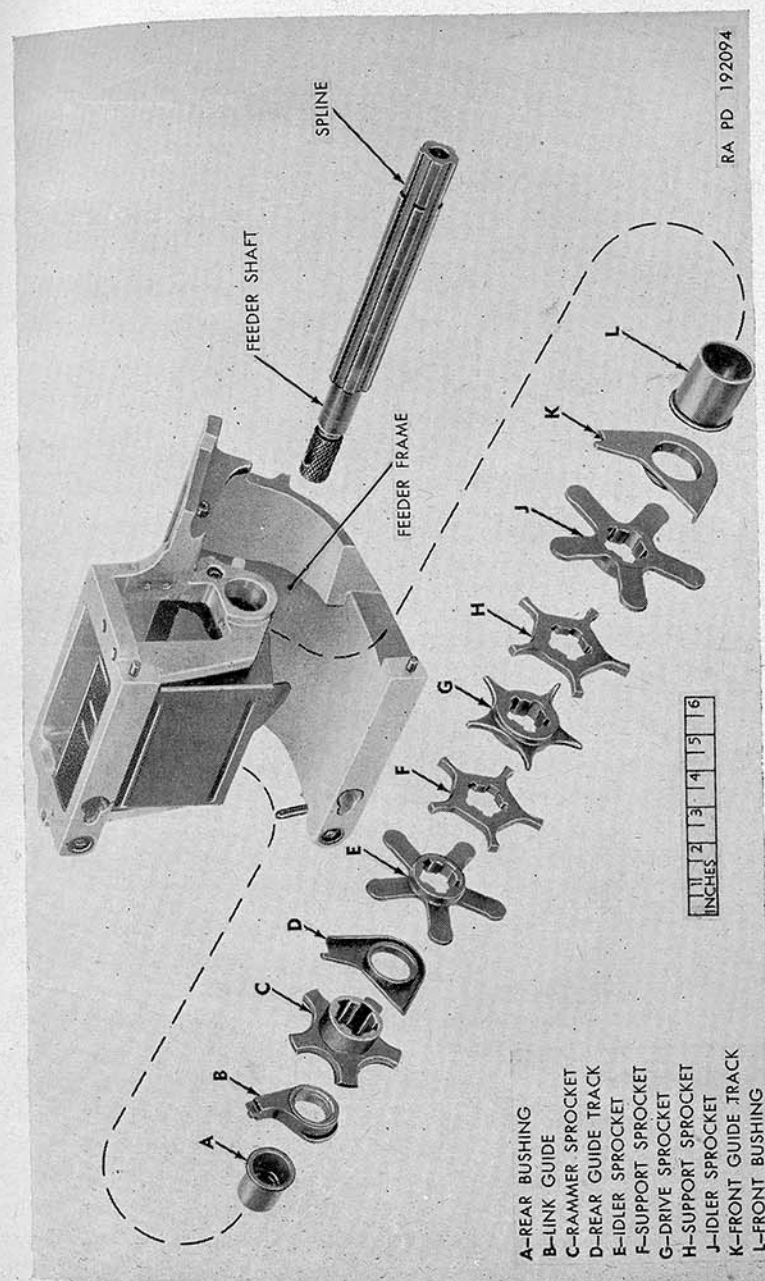


Figure 54. Feeder shaft group removed from feeder frame.

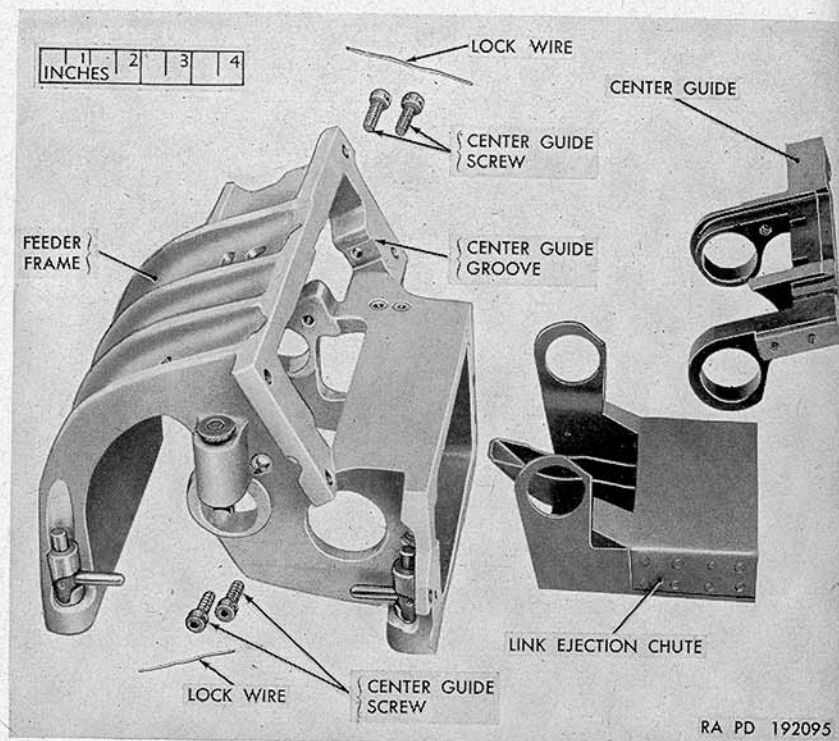


Figure 55. Center guide and link ejection chute removed from feeder frame.

d. Check splines on smaller diameter at forward end of feeder shaft (fig. 54) for burrs and mushrooming. This part of the shaft engages the drum shaft and a mushrooming condition may occur due to the reciprocating action of the drum during recoil and counterrecoil.

e. The link ejection chute is a welded unit. It is necessary to check the spot welds for breaks, particularly after a link jam has occurred. The unit must also be examined for bending and general distortion since it is manufactured from thin gaged metal.

f. Check the bearing surfaces of the center guide (fig. 55) for burrs which may interfere with the insertion of the front and rear bushings (fig. 54).

g. Check tension of feeder shaft lock plunger spring and lock plunger spring (fig. 56) to be sure they fulfill their functions.

h. Check all socket-head screws for distortion of socket heads.

i. The front and rear cartridge guides, their securing screws, the screws for securing the front of the case ejection chute, the screw which secures the center guide, the pins which secure the lock handle to the lock plunger and the knob to feeder shaft lock plunger, and

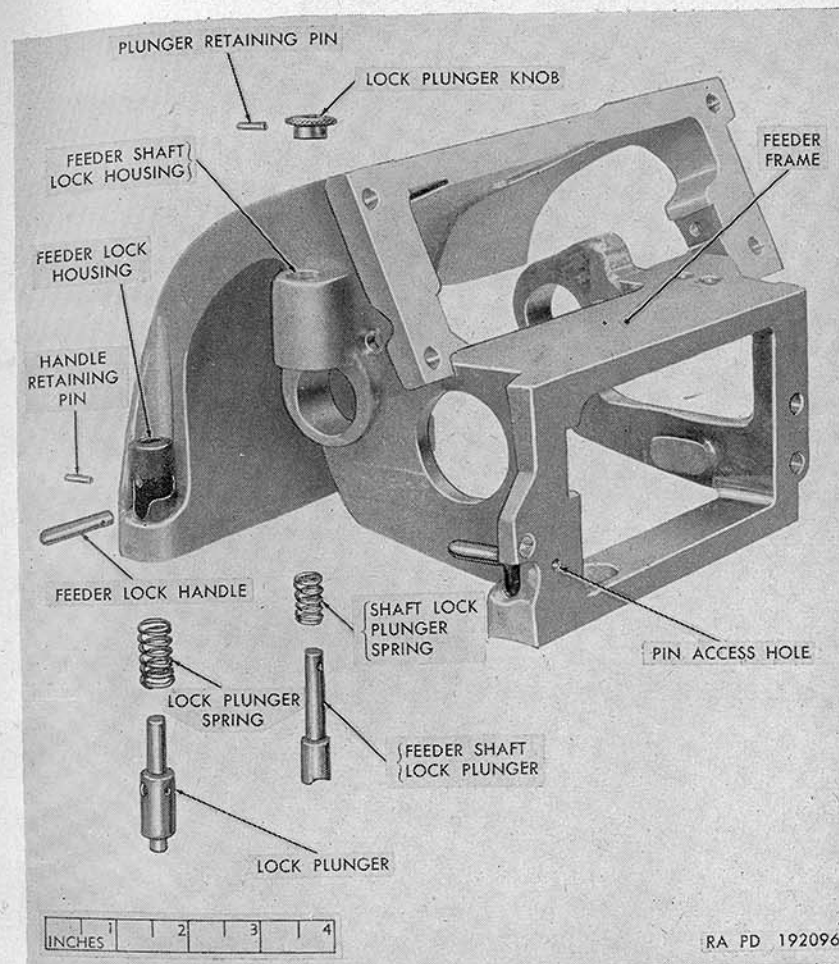


Figure 56. Feeder shaft lock parts and feeder lock parts—exploded from feeder frame.

lockwire are the only replaceable parts at the organizational level of maintenance. If any other part needs replacement, notify maintenance personnel.

59. Assembly

a. Feeder Lock.

- (1) Insert the lock plunger spring over the lock plunger and install in the feeder lock housing from the underside (fig. 56).

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- (2) Position lock plunger so that the large hole is facing toward the rear. Push plunger in against spring until large hole is visible.
 - (3) Insert the feeder lock handle (fig. 56). The lock handle must be positioned so that the hole drilled through its forward end aligns with the smaller hole in the lock plunger.
 - (4) Move handle upward, until the smaller hole in the lock plunger is visible and then insert handle retaining pin (fig. 56).
 - (5) Repeat operation for second feeder lock.
- b. *Feeder Shaft Lock.*
- (1) Slip the shaft lock plunger spring over the shaft lock plunger, and insert the assembled unit into the feeder shaft lock housing (fig. 56) from the underside.
 - (2) Push the feeder shaft lock plunger inward, against the spring, until it protrudes from the top.
 - (3) Position the lock plunger knob on the feeder shaft lock plunger.
 - (4) Aline the hole in the knob with the hole in the plunger and drive in the retaining pin (fig. 56).
- c. *Link Ejection Chute.*
- (1) Insert the link ejection chute (fig. 55) into the opening in the side of the feeder frame.
 - (2) Aline the bearing of the frame with the large diameter holes in the link ejection chute.
- d. *Center Guide.*
- (1) Slide the center guide (fig. 55) into the feeder frame from the feed mouth.
 - (2) Position the center guide in the grooves provided, and aline its bearings with those of the frame and the holes on the link ejection chute.
 - (3) Install the four center guide screws and lock-wire in place.
- e. *Feeder Shaft Group.*
- (1) Install the front and rear bushings (fig. 54) from the inside of the center guide bearings through the feeder frame bearings. The rear bushing can be differentiated from the front bushing by its counterbore.
 - (2) Insert the knurled portion of the feeder shaft from the forward end of the feeder frame through the front bushing.
 - (3) Install the following parts in the order given on the feeder shaft:
Front guide track. Idler sprocket.

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- | | |
|-------------------|-------------------|
| Support sprocket. | Rear guide track. |
| Drive sprocket. | Rammer sprocket. |
| Support sprocket. | Link guide. |
| Idler sprocket. | |
- (4) The forward and rear idler sprocket are interchangeable, but when positioned on the shaft, the projecting shoulders should face each other (fig. 54). The projected shoulder of the rammer sprocket must face forward.
 - (5) The notches on the front and rear guide tracks (fig. 53) must fit into and stay positioned in the corresponding notches of the center guide during assembly.
 - (6) The link guide (fig. 54) must be positioned so that its lever end points toward feeder mouth.
 - (7) Tap feeder shaft through rear bushing (fig. 54), lift feeder shaft latch to allow the shaft to pass under it, and then release latch to engage groove of the feeder shaft (fig. 50).
- Caution:** No parts are to be forced during this assembly. If proper precautions are observed, all elements will fit over splines of feeder shaft. Use no hammers.
- (8) Check functioning of feeder shaft and sprockets for any interference. Feeder shaft and sprockets should spin relatively free.
- f. *Case Ejection Chute.*
- (1) Insert the case ejection chute (fig. 53) into its proper position above the mouth of link ejection chute.
 - (2) Aline the holes of case ejection chute with those of the feeder frame provided for them (fig. 53). Install the case ejection chute front and rear screws (fig. 53). The rear screws are longer than the front screws and are not interchangeable. Lock-wire both sets of screws.
- g. *Cartridge Guides.*
- (1) Install the front cartridge guide in the groove provided in the top of the frame (fig. 53).
 - (2) Aline holes in guide with those of feeder frame and install screws.
 - (3) Lock-wire the screws in place.
 - (4) Install the rear cartridge guide, in a similar manner, being sure that the proper screws have been used. The front cartridge guide securing screws are much longer than those of the rear cartridge guide (fig. 53).

60. Installation

- Lift the feeder shaft latch (fig. 53) and withdraw the feeder shaft as far as possible.
- Lift and rotate the feeder lock handles (par. 56b) to retract the lock plungers.
- Place feeder mounting pin openings, on feeder frame, over feeder mounting pins of the receiver (fig. 52). Lower feeder assembly onto receiver, engaging mounting pins and holes.

Note. Be sure sprockets are alined in such a position as to clear slide rammer.

d. Slide feeder forward to engage receiver "L" slots with feeder locating pins (fig. 52).

e. Rotate and release feeder lock (fig. 51). Make sure feeder is locked securely by checking position of the lock plunger. It must be flush with the top surface of the feeder lock housing.

f. Lift feeder latch to relieve pressure on feeder shaft. Push feeder forward gently, until feeder shaft splines are properly alined in the splines in the drum shaft (fig. 35) and the recess groove engaged by the feeder shaft latch (fig. 50).

Section VI. OPERATING SPRING AND END PLATE GROUP

61. General

The primary function of the operating springs is to assist in the return of the operating slide to battery. They seat in two holes in the rear of the operating slide and ride on two guides, which hold them in position. The springs are of stranded wire construction, and are lubricated with graphite. The total force exerted by the two springs is 80 pounds, when the slide is forward (in battery) and 187 pounds when the slide is fully rearward.

62. Removal

Note. The removal of the operating springs and receiver end plate can take place before or after the removal of the feeder assembly.

a. Insert the removing or replacing operating spring tool 7188576 (figs. 28 and 57) into the hole in the operating spring guide until the notches of the guide are engaged by the pin of the tool.

b. Push guide forward, compressing operating springs (fig. 57).

c. Maintain pressure and rotate tool and guide until tabs on guide clear the opening in the receiver end plate (fig. 58).

Caution: Release pressure against spring slowly to prevent the spring and guide from flying out.

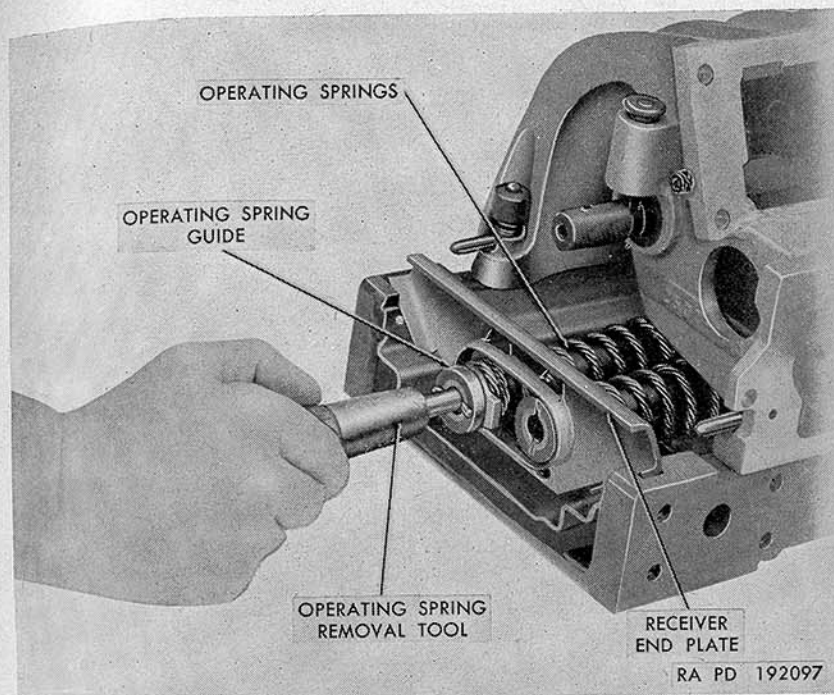


Figure 57. Removal of operating springs from gun.

- Withdraw operating springs from spring guides (fig. 59).
- Push forward on lower end of receiver end plate to disengage plate from recess in base of receiver (fig. 58).
- Lift end plate from receiver.

63. Maintenance

- Check operating springs for kinks or deformation.
- Check tabs on operating spring guide to be sure they are straight. Inspect the guide body for possible burring which may impair spring's movement.
- Check end plate for straightness and deformation. Cracks may occur across the narrow strip of metal on the lower portion where the plate engages the receiver.

64. Installation

- Install the receiver end plate (fig. 58) by holding the lower portion angled toward the muzzle end of gun. Lower end plate so that

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it engages the end plate grooves provided in receiver. Swing lower portion of end plate into slotted recess in the receiver base.

b. Install operating springs on guides (fig. 59).

c. Insert springs and guides through opening in receiver end plate. Continue forward until springs seat in the holes in the rear of the operating slide.

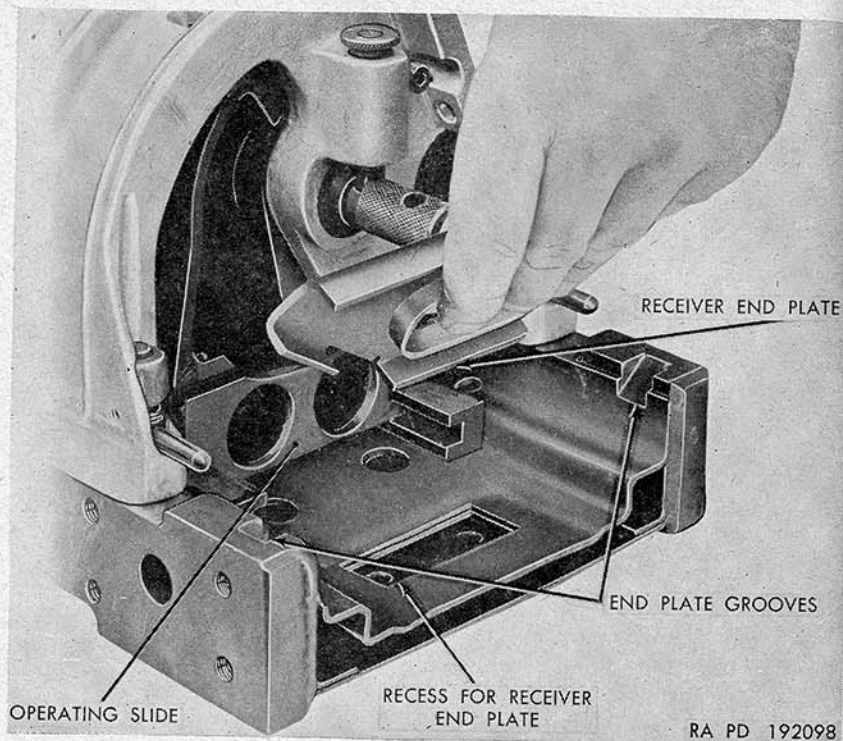


Figure 58. Removal of receiver end plate from gun.

d. Insert removing or replacing operating spring tool 7188576 (figs. 28 and 57) into opening in rear of guides, until the pin on the tool engages the notch of the guide (fig. 57).

e. Push forward, compressing operating spring until tabs of operating spring guide clear the opening in the receiver end plate.

f. Turn approximately 90° until the tabs are vertical and will contact engaging notches of end plate.

g. Release pressure and allow tabs to seat in notches.

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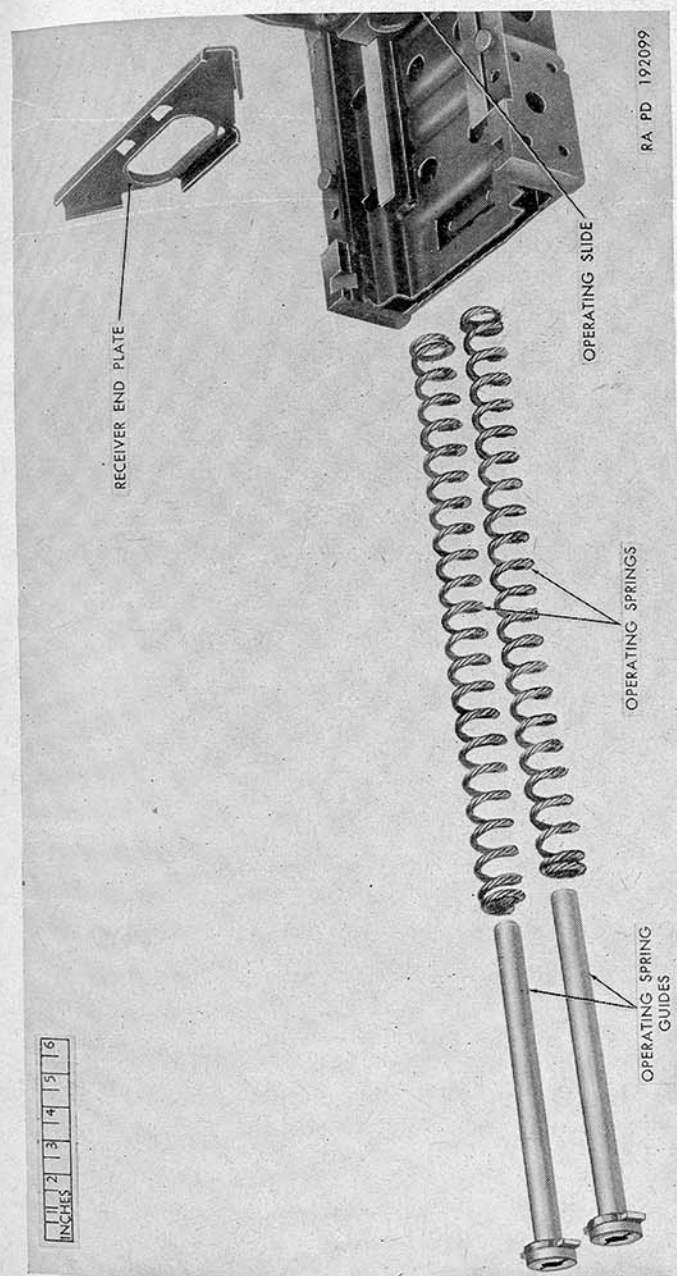


Figure 59. Operating springs and end plate—exploded from gun.

Section VII. DRUM GROUP

65. General

The drum assembly (figs. 3 and 4) rotates on the drum shaft (fig. 33), within the drum cradle. It has five chambers which are brought into firing position in succession when firing the gun. When the drum assembly is properly installed in the drum cradle, the forward face of the chamber in the 6-o'clock position contacts the breech face of the tube which extends through to the inside face of the drum cradle (par. 3c). When firing, the seals in the forward end of the drum assembly are forced against the breech face of the tube by propellant gases to prevent serious leakage of gas. Five circumferential grooves on each seal prevent a leakage of gas between the seals and the seal recess of the drum body. A seal retainer serves to hold the seals in the drum, preventing them from entering the bore of the drum cradle if the barrel assembly should be removed.

66. Removal

a. It is necessary to remove the feeder assembly (par. 56) prior to removal of the drum group.

b. Unlock the drum shaft latch assembly (fig. 45) by forcing the latch lock over its pin, freeing the latch retainer.

c. Lift the drum shaft latch assembly sufficiently to clear the latch plunger from the locking groove of the shaft.

d. Lift upward on drum assembly to relieve pressure on drum shaft with drum lifting hook (fig. 26). Pull "star" end of drum shaft from drum cradle and drum assembly. Lift drum assembly out of drum cradle (fig. 60).

67. Disassembly

a. Remove seal retainer (fig. 61) which seats on the bushing in the forward end of the drum assembly.

b. Withdraw the five drum seals (figs. 61 and 62). If a drum seal should jam, notify field maintenance personnel.

c. Removal of the drum rollers is not within the scope of organizational level of maintenance. Further disassembly of the drum assembly is prohibited.

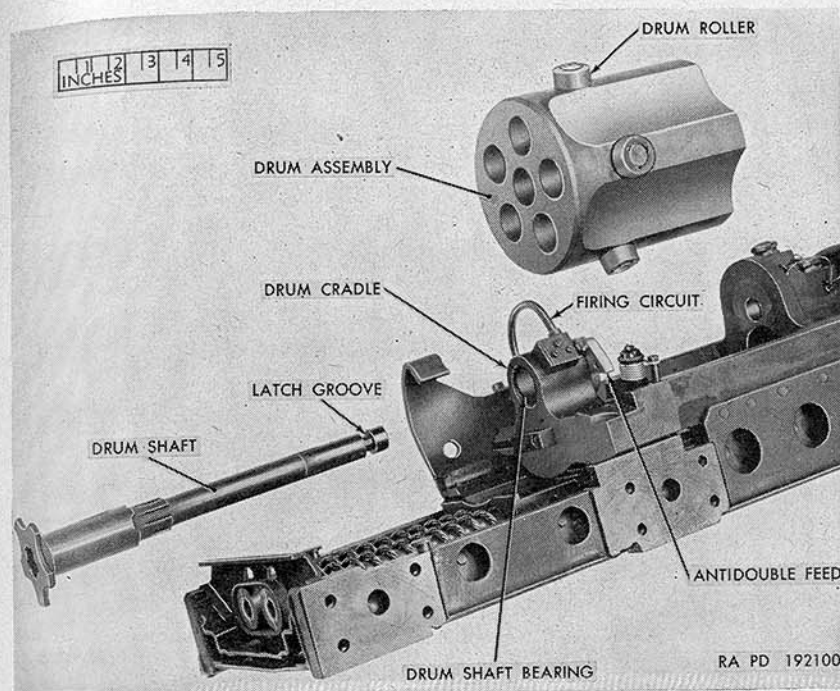


Figure 60. Drum assembly removed from drum cradle.

68. Maintenance

a. Check the drum seals for cracks which are likely to occur at the forward end.

b. Check seals for copper fouling and gas erosion.

c. Replace seal if any of the conditions given in a and b above exist.

d. Examine the seal retainer for deformation and cracking. When in place, the seal retainer must just contact the edge of the seal (fig. 61) to hold the seal in place.

e. Clean and lubricate seal recess and chamber as outlined in paragraph 32.

f. Check drum rollers for cracks and mutilation.

g. For parts replacement, other than the drum seals, notify maintenance personnel.

69. Assembly

a. Insert drum seals (fig. 63) in the recesses in the drum body with the notched end in.

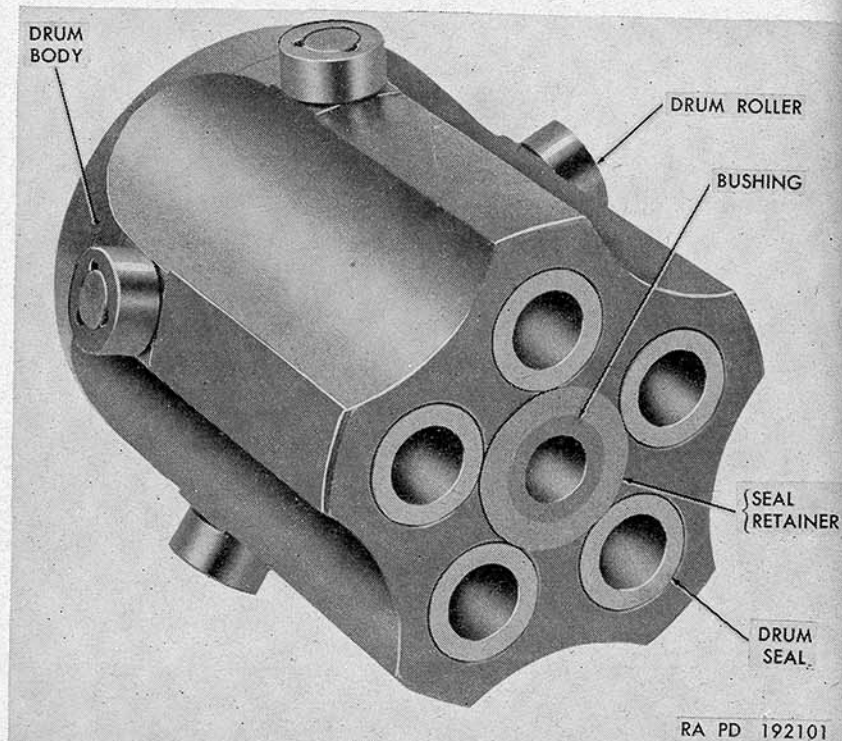


Figure 61. Drum assembly.

b. Replace seal retainer over the projecting bushing on the forward face of the drum body (fig. 61).

70. Installation

Note: Before installing the drum assembly, the operating slide must be in complete battery (par. 38b).

a. Grasp drum assembly (fig. 64) firmly in both hands, keeping index finger over seal retainer to hold it in place. Position the drum assembly over the drum cradle so that one roller is above the cam path of the operating slide.

b. Lower drum roller (fig. 64) into cam path of the operating slide. Take care not to damage the antidouble feed (fig. 60) as the drum assembly is being lowered.

c. Align center hole of drum assembly with the drum shaft bearing of the drum cradle.

d. Insert the drum shaft through the drum shaft bearing and part way into drum assembly.

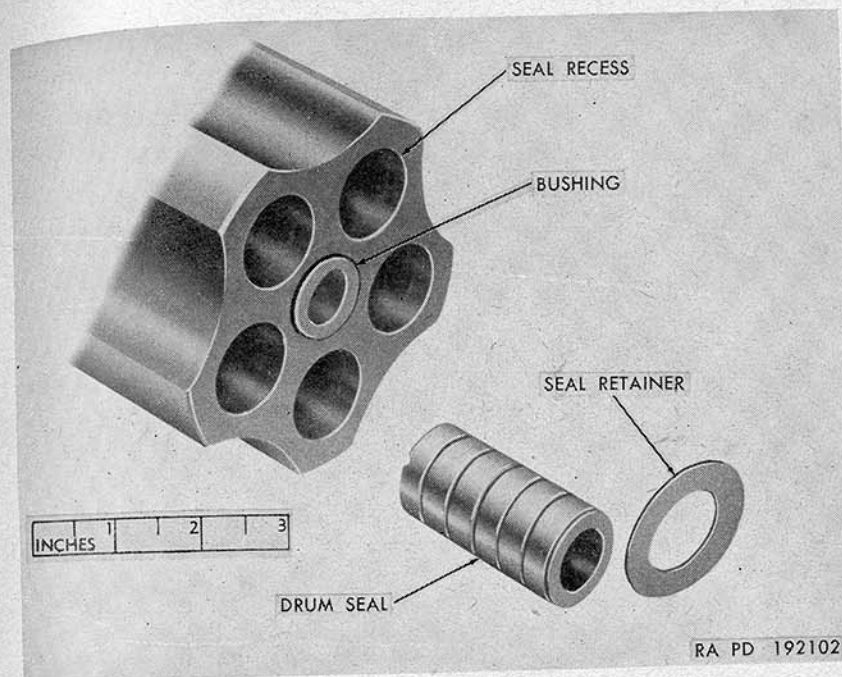


Figure 62. Drum seal and seal retainer removed from drum.

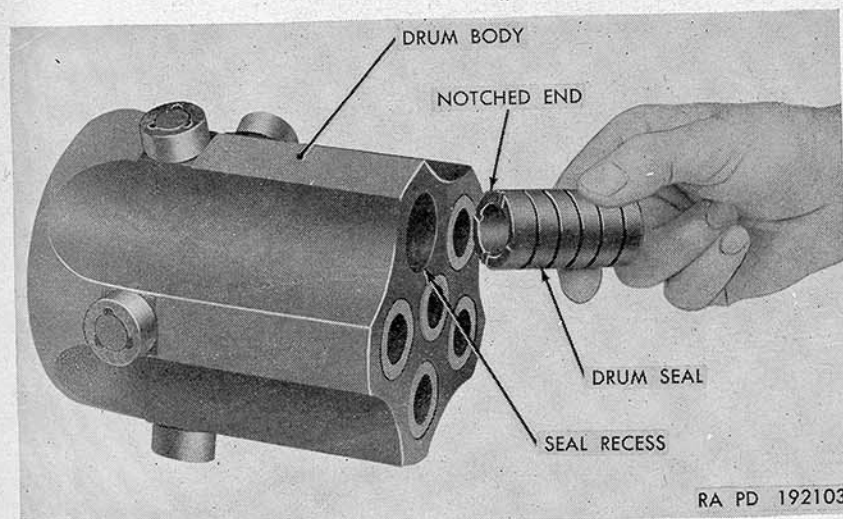


Figure 63. Installation of drum seals.

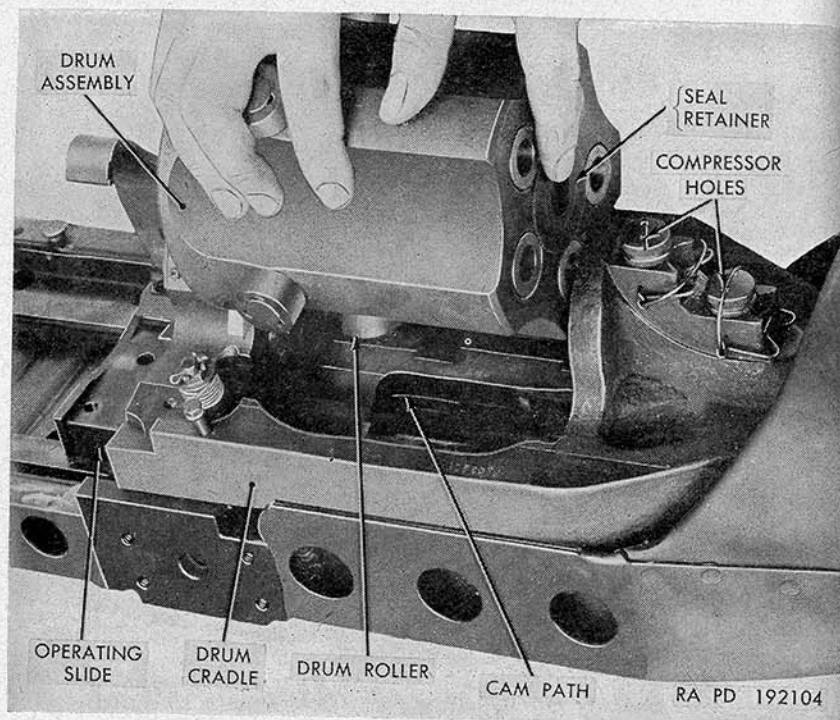


Figure 64. Installation of drum assembly on gun.

e. Keep one point of the "star" end of the drum shaft pointing up to insure alinement of drum shaft splines with those of drum assembly.

f. Lift drum assembly to relieve pressure from drum shaft and gently push the drum shaft forward as far as possible.

g. Lift the drum shaft latch (fig. 45) and continue to push the drum shaft forward.

h. Release drum shaft latch. Check to see that the latch plunger has engaged the groove of the drum shaft (fig. 60) by attempting to withdraw the drum shaft.

i. Lock the drum shaft latch by positioning the drum latch retainer over the head of the drum latch and forcing the latch lock over the latch lock pin (fig. 45).

j. Replace feeder assembly (par. 60).

Section VIII. CRADLE GROUP

71. General

a. The central recoiling unit of the gun is the drum cradle (figs. 3 and 4). It is guided in recoil and counterrecoil by the "L" slots (fig. 52) of the receiver and by the forward bearing of the receiver, within which it seats. Both the barrel assembly and the drum assembly are secured to the drum cradle, making the three components recoil as a unit.

b. The drum cradle also serves as a mount for the firing circuit (fig. 65), the extractor group, the gas cylinder group (par. 39b), the firing pin and anvil assembly, and the barrel and drum latches (fig. 45).

c. The drum cradle is connected to the recoil springs (par. 83b), which limit the rearward movement of the recoiling units.

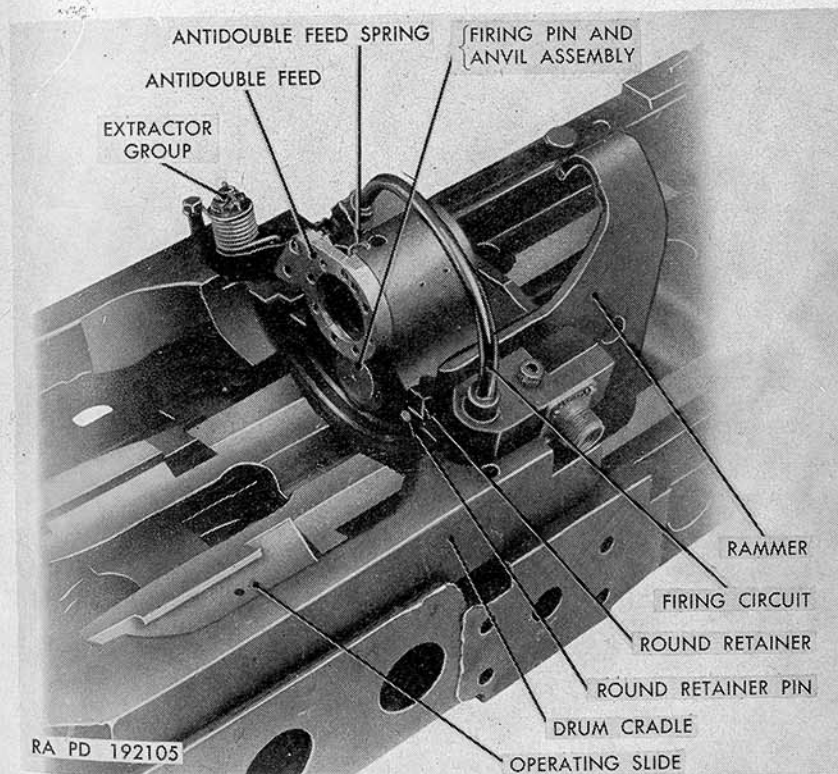


Figure 65. Drum cradle group installed on receiver.

72. Removal

a. Remove feeder assembly (par. 56), barrel assembly (par. 51), operating spring and end plate group (par. 62), and drum group (par. 66).

b. Remove cotter pins from recoil spring shafts (fig. 66), and remove the slotted nuts and washers.

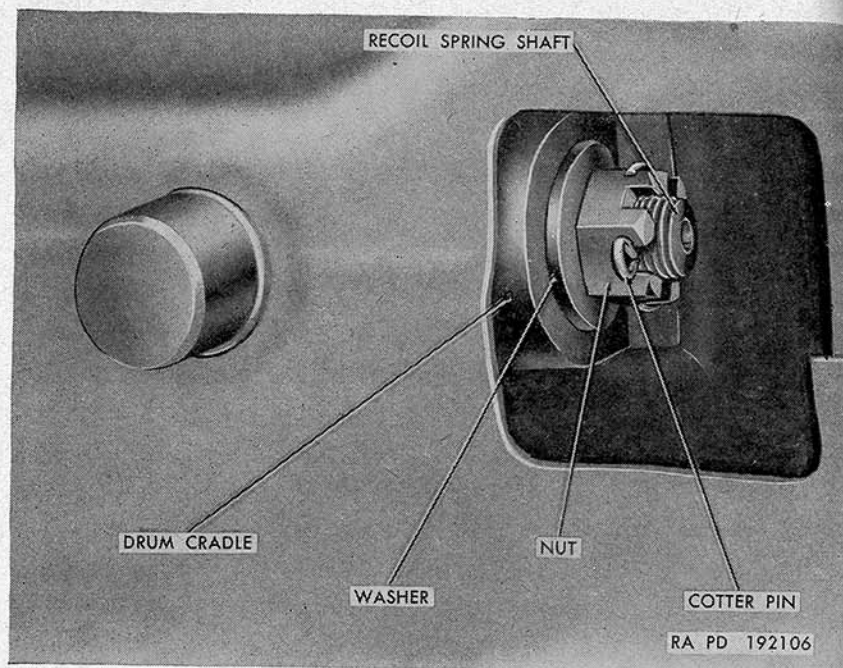


Figure 66. Method of securing drum cradle to recoil springs.

- c. Block up the receiver to provide clearance for the gas cylinder.
- d. Pull the operating slide as far rearward as possible.
- e. Pull the drum cradle group rearward until it clears the front bearing of the receiver and "L" slots, and lift it from the receiver (fig. 67).

73. Disassembly

Note. The disassembly of the cradle is restricted to the organizational mechanic only.

a. Removal of Antidouble Feed.

- (1) Disengage the male contact of the antidouble feed device from the female contact of the firing circuit (fig. 35).

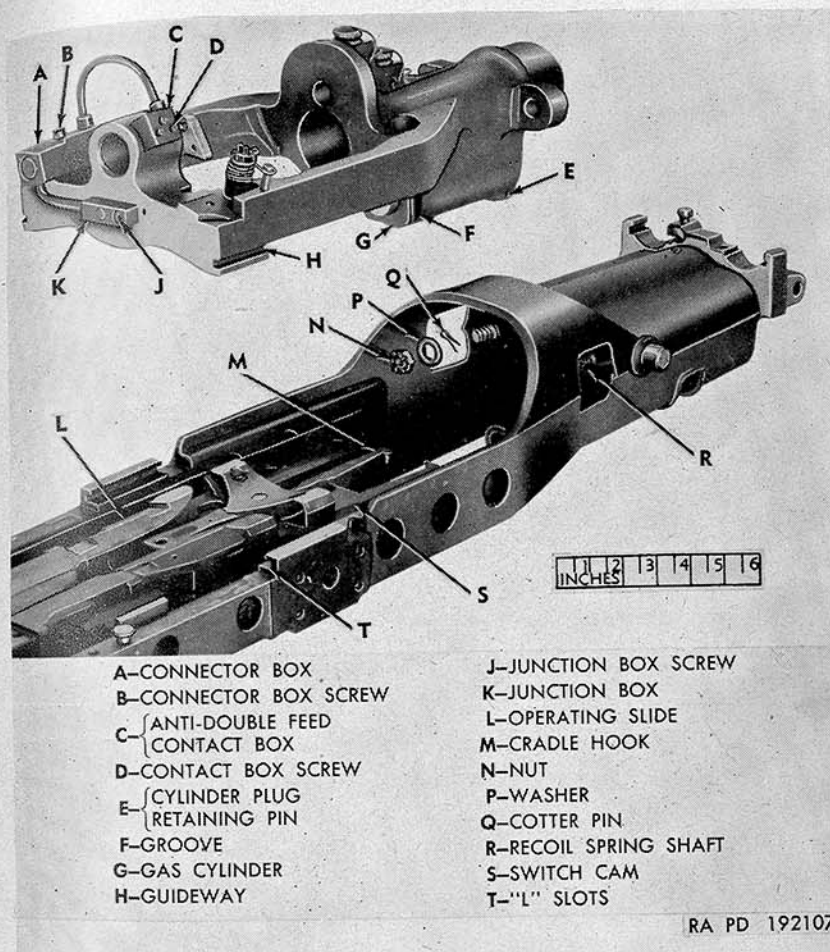


Figure 67. Drum cradle group removed from gun.

- (2) Lift antidouble feed upward to free the antidouble feed spring from the drum cradle.
 - (3) Remove antidouble feed spring from antidouble feed (fig. 69).
- b. *Removal of Firing Circuit.*
- (1) Remove the four socket-head screws that retain the firing circuit to the drum cradle (fig. 67); one at the junction box, one at the connector box, and the two lower screws on the antidouble feed contact box. Do not free third screw in antidouble feed contact box. This retains the cover.

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- (2) Pull junction box rearward slightly until contact point is free of the firing pin extension (fig. 68).
- (3) Hold junction box in rearward position and insert screwdriver under connector box.
- (4) Pry upward on connector box until nylon insulator is withdrawn from drum cradle, and remove firing circuit from drum cradle (fig. 69).

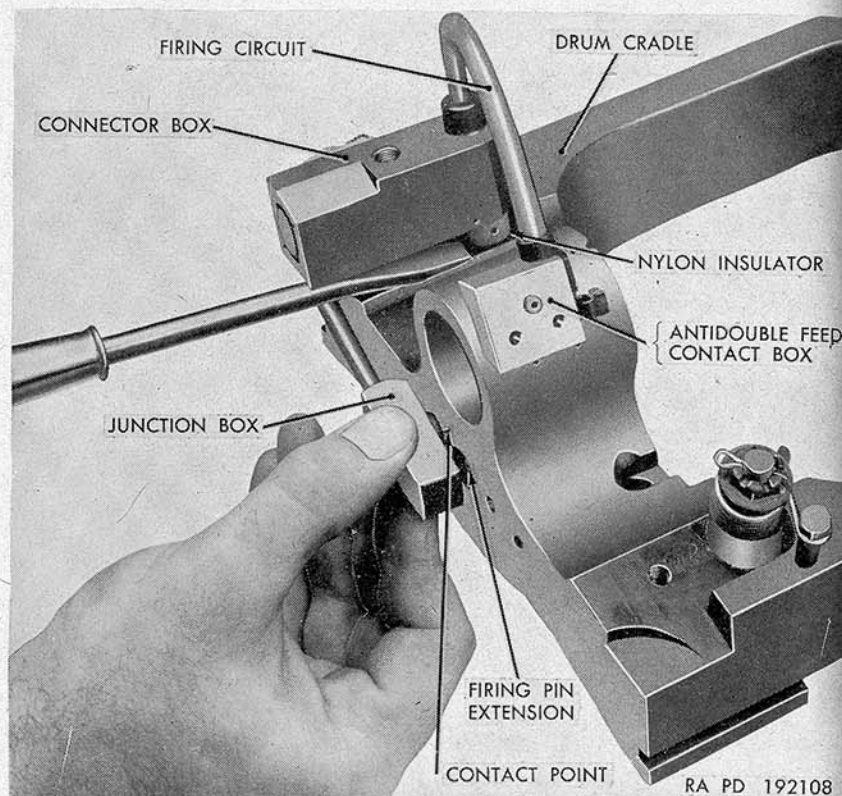


Figure 68. Removal of firing circuit from drum cradle.

c. Removal of Round Retainer (fig. 69).

- (1) Drive out the round retainer pin from the rear, forward. Before the pin is completely out, depress the round retainer so that spring will not be released too suddenly.
- (2) Remove the round retainer and round retainer spring from the drum cradle.

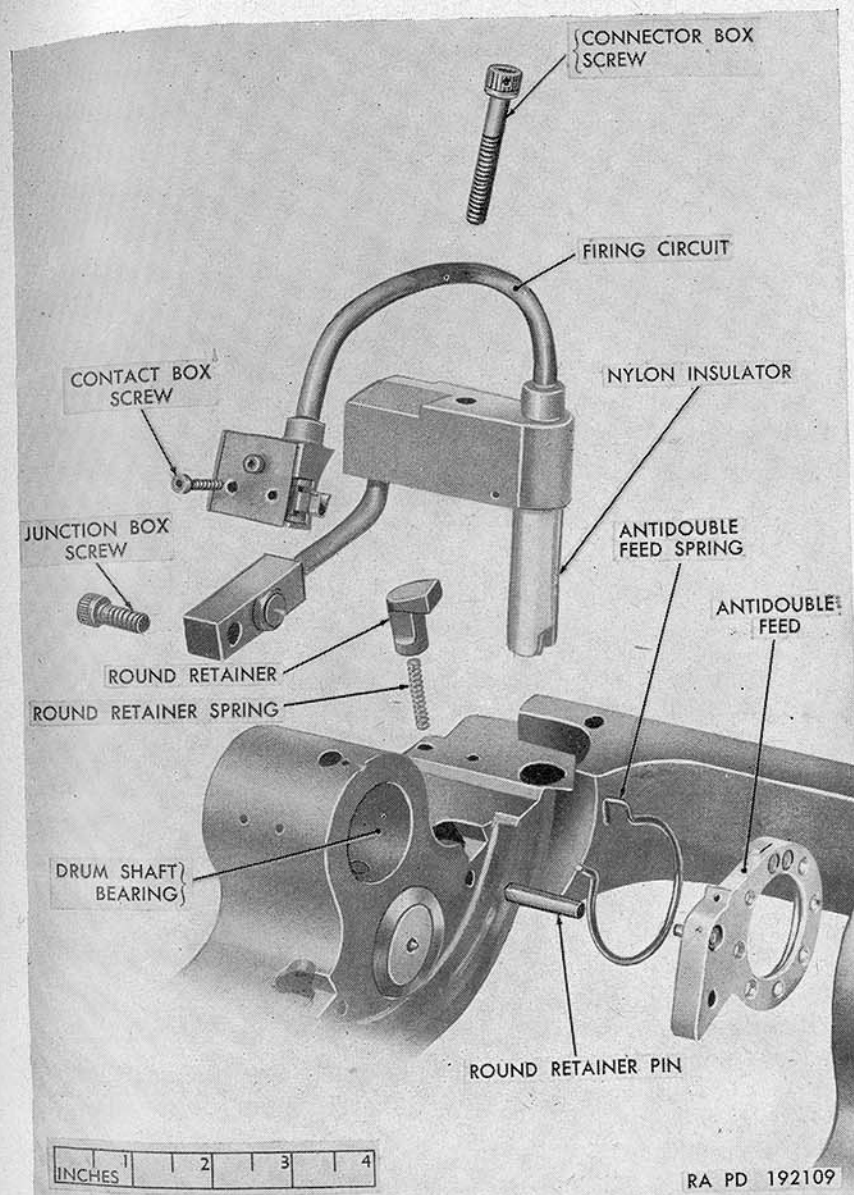


Figure 69. Firing circuit, round retainer group, and antidouble feed—exploded from drum cradle.

d. Removal of Firing Pin and Anvil Assembly.

- (1) Remove the anvil retaining set screw by means of the hole provided in top of the drum shaft bearing (fig. 70).

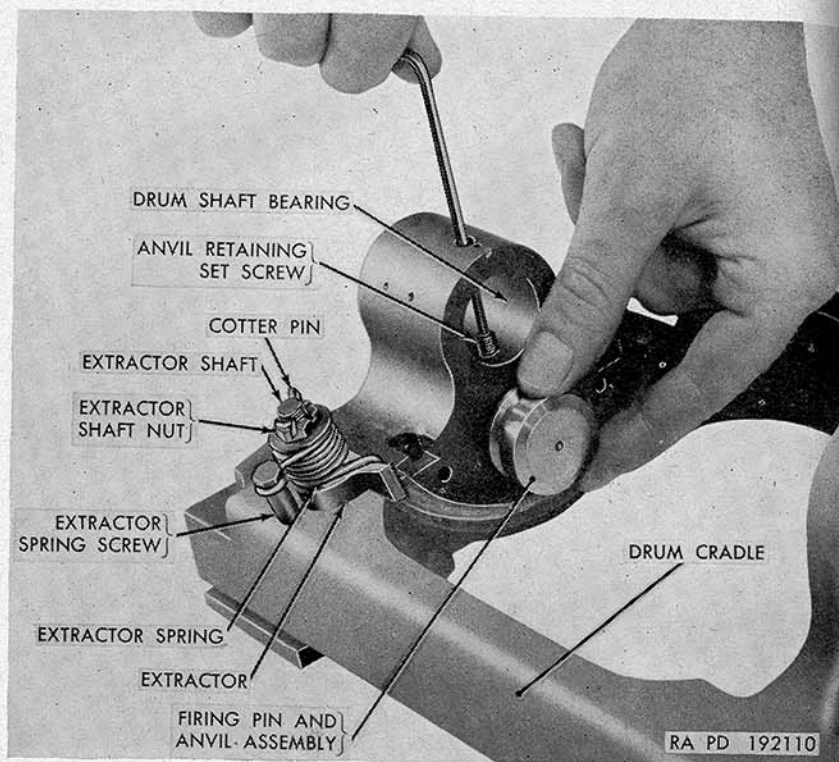


Figure 70. Removal of firing pin and anvil assembly from drum cradle.

- (2) Push firing pin extension from the rear and withdraw firing pin and anvil assembly.
- (3) Withdraw firing pin extension insulator from rear of drum cradle.

e. Removal of Extractor Group (fig. 71).

- (1) Remove the cotter pin.
- (2) Unscrew the extractor shaft nut from the extractor shaft.
- (3) Unscrew the extractor spring screw from the drum cradle. The extractor spring will follow with the screw.
- (4) Remove extractor spring spacer.
- (5) Withdraw extractor from splines of extractor shaft and allow extractor shaft to drop out.
- (6) Remove extractor shaft bushing, using a drift if necessary.

f. Removal of Barrel Latch and Drum Shaft Latch Assemblies.

- (1) Remove the latch locks and latch retainer (fig. 72) by pulling them from their holes in the drum cradle.

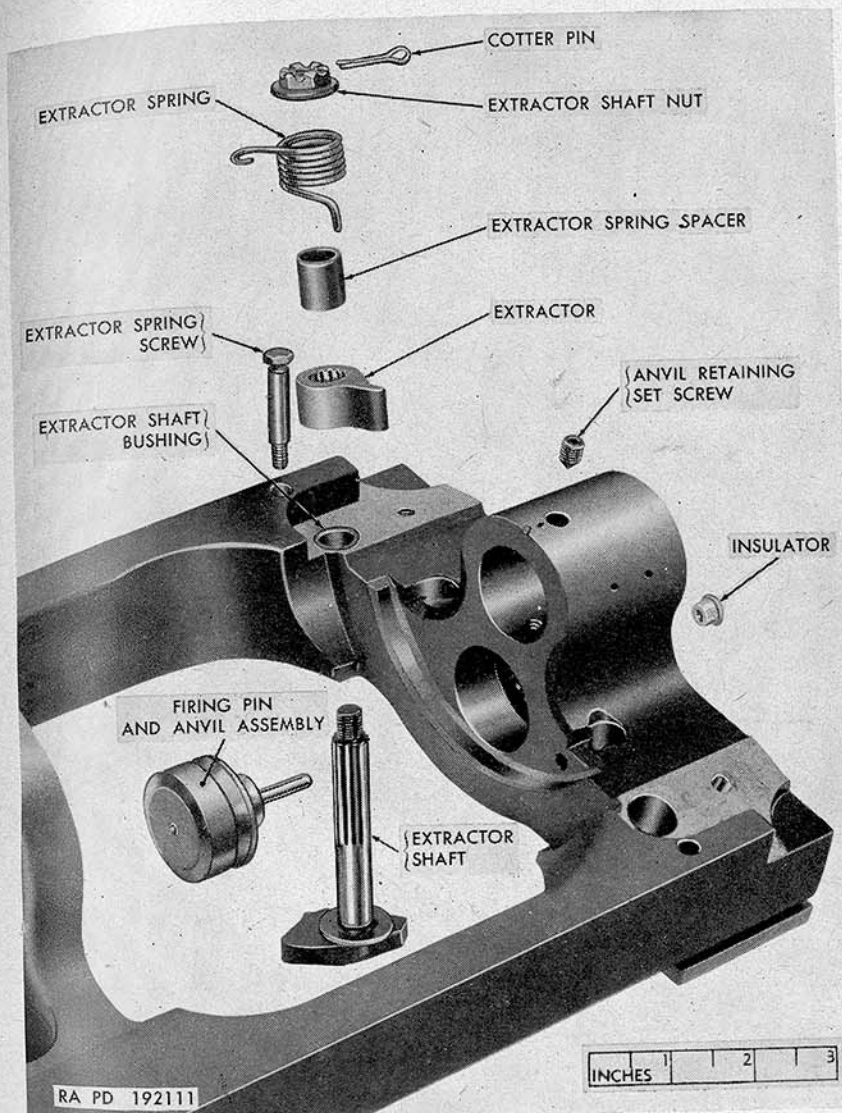


Figure 71. Extractor group and firing pin and anvil assembly—exploded from drum cradle.

- (2) Remove barrel latch assembly and drum shaft latch assembly.
- (3) Drive out knob retaining pins (fig. 72).
- (4) Withdraw washer, spring, and plunger.

Note. The barrel latch plunger and the drum shaft latch plunger are not identical; the barrel plunger is round while the drum shaft plunger has been notched.

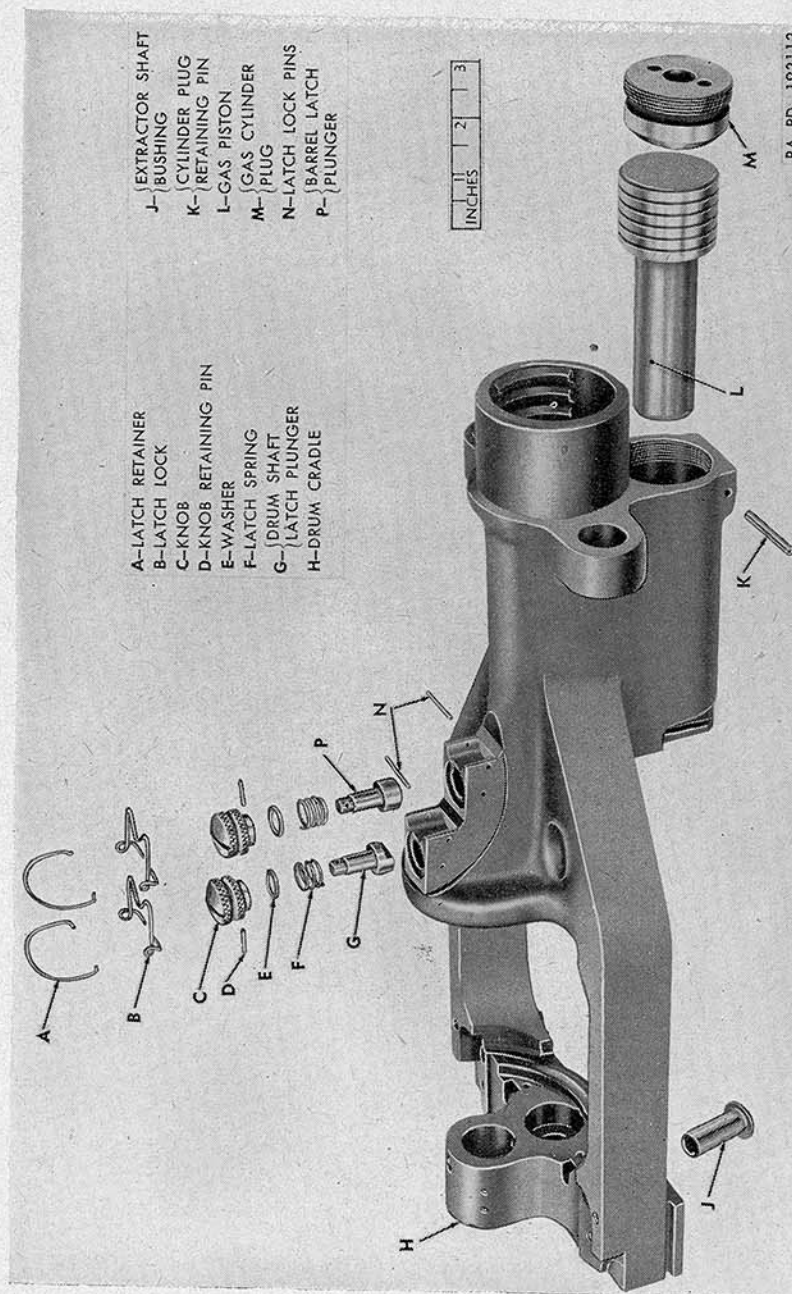


Figure 72. Cradle group parts—exploded from drum cradle.

g. Removal of Gas Cylinder Group (fig. 72).

- (1) Drive out cylinder plug retaining pin.
- (2) Unscrew gas cylinder plug with gas cylinder plug pin spanner wrench 7188579 (fig. 31).
- (3) Push out gas piston.

74. Maintenance

a. Antidouble Feed.

- (1) Check the contact to see that it is securely in place.
- (2) Inspect antidouble feed spring for cracks or deformation.
- (3) When necessary to replace either the spring or antidouble feed, notify maintenance personnel.

b. Firing Circuit (fig. 69).

- (1) Check conduits for breaks.
- (2) Inspect contact blades of the antidouble feed contact box and the nylon insulator. Too much space between them will result in poor contact. The contact blade of the operating slide mates with the contact on the end of the nylon insulator.
- (3) Inspect nylon insulator for cracks or deterioration.
- (4) Notify maintenance personnel for replacement of firing circuit whenever inspection reveals the necessity.

c. Round Retainer Group (fig. 69).

- (1) Inspect top edges of round retainer for burrs. Burred edges will cause sluggish return of round retainer. Remove burrs with crocus cloth.
- (2) Check round retainer spring for rust or permanent set.
- (3) Inspect for mushrooming of round retainer pin.
- (4) Notify maintenance personnel for necessary replacement of parts.

d. Firing Pin and Anvil Assembly (fig. 71).

- (1) Check for rust accumulation.
- (2) Inspect the hole in the firing pin extension to be sure it is clear of foreign matter which might prevent good electrical contact.
- (3) Check condition of insulator in which the firing pin extension seats.
- (4) Check firing pin hole for blow splinters or other obstructions which will prevent proper protrusion of firing pin.
- (5) Check tension of firing pin spring by pushing firing pin inward. When released, the firing pin should snap out quickly.
- (6) If inspection shows firing pin and anvil assembly unserviceable, replace.

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e. *Extractor Group* (fig. 71).

- (1) Inspect the extractor shaft splines for burrs, and remove if found.
- (2) Inspect lower cam surface of shaft for possible distortion, cracks, or wear caused by striker during cycling, and replace shaft, if necessary.
- (3) Inspect internal spline of extractor for burrs and pawl edge for chips, and replace extractor, if necessary.
- (4) Check nut and shaft threading for wear.
- (5) Inspect extractor spring screw for straightness and cracks, and replace when necessary.
- (6) Replace extractor spring when unserviceable.
- (7) Remove rust from all parts. Clean and lubricate as directed in paragraphs 32 and 33.

f. *Drum Cradle Body* (fig. 72).

- (1) Inspect threads in forward bearing for burrs, and remove if found.
- (2) Check the external surface of forward bearing and the guideways at rear for burrs or other obstructions which might interfere with the rearward and forward motion of the cradle.
- (3) Check all threaded holes, recesses, and bearings for cleanliness.
- (4) Clean and lubricate as outlined in paragraphs 32 and 33. Pay particular attention to the forward bearing and the guideways.

g. *Drum Shaft Latch and Barrel Latch* (fig. 72).

- (1) Clean all rust or dirt from all parts.
- (2) Inspect the edges of both plungers for burrs, and remove if found.
- (3) Check latch locks and latch retainers for distortion.
- (4) Inspect the latch lock pins and knob retaining pins for wear or damage, and replace if necessary.
- (5) For replacement of any other parts, notify maintenance personnel.
- (6) Lubricate all parts before assembly.

h. *Gas Cylinder*.

- (1) Inspect the gas piston for cracks, particularly around the inside shoulder.
- (2) Inspect the threads on the gas cylinder plug and within the gas cylinder.

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- (3) Replace cylinder plug retaining pin whenever it shows signs of wear.
- (4) Coat surface of piston with light oil before assembling.

75. Assembly

a. *Installation of Extractor Group*.

- (1) Insert extractor shaft bushing (fig. 72) from underside of drum cradle into proper hole. The bushing goes into the hole on right side for right-hand feed and into the hole on the left side for left-hand feed.
- (2) Insert extractor shaft (fig. 71) into bushing from the underside and place the extractor on the shaft.

Note. The extractor is reversible for left-hand and right-hand feed. When installed properly, the contacting lip will be cupped rearward.

- (3) Install extractor spring spacer (fig. 71) above the extractor.
- (4) Install extractor spring over the spacer so that the tail of the spring is in contact with the rear face of the extractor.
- (5) Screw extractor shaft nut onto end of shaft. Do not tighten.
- (6) Install the extractor spring screw (fig. 71) into threaded hole of drum cradle and hook extractor spring into the groove provided at the head end of the screw.
- (7) Tighten extractor shaft nut and install and secure cotter pin (fig. 70).

b. *Installation of Round Retainer Group* (fig. 69).

- (1) Insert round retainer spring and round retainer into the well provided in drum cradle. Two holes are available for the installation of the group, one on each side of the drum shaft bearing at the rear of the drum cradle. For right-hand feed, the round retainer is installed in the well on the left side (looking toward muzzle) and on the right side for left-hand feed.
- (2) Insert round retainer pin from rear of drum cradle and tap in part way.
- (3) Depress round retainer spring, by pressing down on round retainer, to align notch cut into the round retainer with round retainer pin. Finish driving pin through. Be sure pin does not extend beyond inside face of drum cradle to hamper cycling of drum assembly.

c. *Installation of Firing Pin and Anvil Assembly*.

- (1) Insert firing pin and anvil assembly (fig. 71) into recess provided below rear drum shaft bearing.

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- (2) Screw anvil retaining set screw (fig. 70) to retain anvil in position.

Caution: Be sure anvil retaining screw is below the surface of the drum shaft bearing or the drum shaft will be damaged when it is installed.

- (3) Install the insulator (fig. 71) on the firing pin extension (fig. 68) by inserting it from the rear of the drum cradle.

d. Installation of Firing Circuit.

- (1) Insert the nylon insulator portion of the firing circuit, having the contact (fig. 69), into the hole which corresponds to that in which the extractor group is assembled on the opposite side of the drum cradle.

Note. The extractor shaft bushing (fig. 72) modifies the hole for use by the extractor group and provides for switching from one feed to the other by allowing the same hole to be used by either the firing circuit or the extractor group.

- (2) Exert pressure downward and twist slightly, being careful not to damage contact point (fig. 68).
- (3) Pull junction box rearward slightly to clear back face of drum cradle, and install contact point into the hole of the firing pin extension (fig. 68).
- (4) Install the socket-head screws in junction box, connector box, and antidouble feed contact box (figs. 67 and 68).

Caution: When installing the two screws in the antidouble feed contact box, be sure not to apply too much pressure. This may depress the box cover and damage the insulation beneath.

e. Installation of Antidouble Feed (figs. 65 and 69).

- (1) Install end of antidouble feed spring into the hole provided in antidouble feed.
- (2) Install spring and antidouble feed on the drum shaft bearing by means of the hook end of the spring.

f. Installation of Gas Cylinder Group (fig. 72).

- (1) Insert the gas piston in gas cylinder well (shaft end leading).
- (2) Screw gas cylinder plug in as far as possible, with gas cylinder plug pin spanner wrench 7188579 (fig. 31).
- (3) Check gas piston movement, making sure that when it is resting against the inside face of the plug, it does not extend beyond the rear of the gas cylinder. If necessary, withdraw the gas cylinder plug.
- (4) Install the cylinder plug retainer pin.

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g. Installation of the Drum Shaft Latch and Barrel Latch Assemblies (fig. 72).

- (1) Install a latch spring and a washer on each plunger.
- (2) Install knob on plunger shaft and align holes in knob with those of plungers.
- (3) Install knob retaining pin.
- (4) Insert latch assemblies in recesses of drum cradle. Be sure proper latch is in each hole (par. 73f(4)).
- (5) Install latch retainers through eyes of latch locks.
- (6) Using drum shaft and barrel latches spring compressor 7188578 (fig. 25), force washer inward against latch spring by inserting two prongs of the compressor into the compressor holes (fig. 64), press downward, and hold the spring in compressed position.
- (7) Spread latch locks, position over their respective holes, and release.
- (8) Lift upward on each latch assembly to be sure each latch assembly has been retained by the installation of the locks.

76. Installation

a. Before installation of the cradle group, the operating slide and switch cam must be properly positioned in order to provide sufficient clearance for the front bearing of the drum cradle to be slid under the top of the receiver. The cradle hooks of the switch cam must be approximately below the grooves machined at the rear of the gas cylinder (fig. 67). Operating slide should be approximately flush with rear of the receiver.

b. Lower cradle so that hooks of switch cam engage the grooves on the gas cylinder.

c. Push cradle forward until the front bearing face of the drum cradle extends beyond threaded portion recoil spring shaft. Be sure the rear guideways of the drum cradle (fig. 67) engage the "L" slots of the receiver.

d. Install washers and nuts on recoil spring shafts (fig. 66). Tighten both nuts with an equal amount of pressure to apply equal tension to the two recoil spring assemblies.

e. Install and secure cotter pin in recoil spring shaft (fig. 66).

f. Return the operating slide (fig. 73) to battery, pulling the extractor rearward and pushing the operating slide as far forward as possible.

g. Install drum group (par. 70).

h. Install operating springs and end plate group (par. 64).

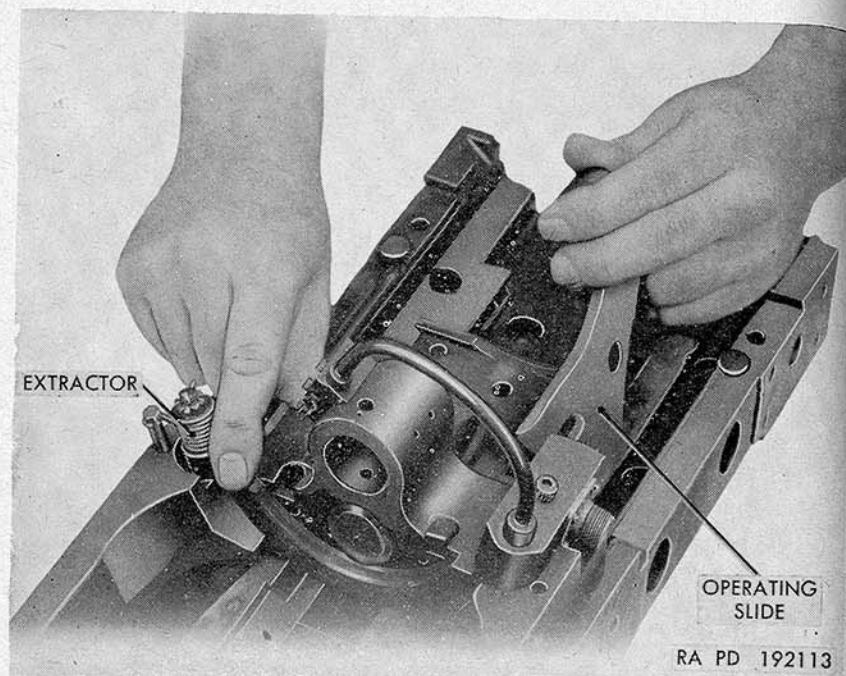


Figure 73. Returning operating slide to battery.

- i. Install feeder assembly (par. 60).
- j. Install barrel assembly (par. 54).

Section IX. OPERATING SLIDE AND SWITCH CAM

77. General

a. The operating slide (fig. 74) and switch cam ride in ways in the bottom of the receiver. The switch cam is a recoiling part of the gun since it is attached to the drum cradle. The switch cam causes the switch tongue of the operating slide to pivot during cycling, thereby changing the cam path in the operating slide (par. 41).

b. Mounted on the operating slide is the striker for actuating the extractor (fig. 74), the contact blade for breaking the electric circuit (par. 42), the rammer for stripping and chambering, and the extractor cam used to insure positive action of the extractor (par. 45). The cam path, machined into the operating slide, engage the rollers of the drum assembly to cause drum rotation during cycling (par. 41).

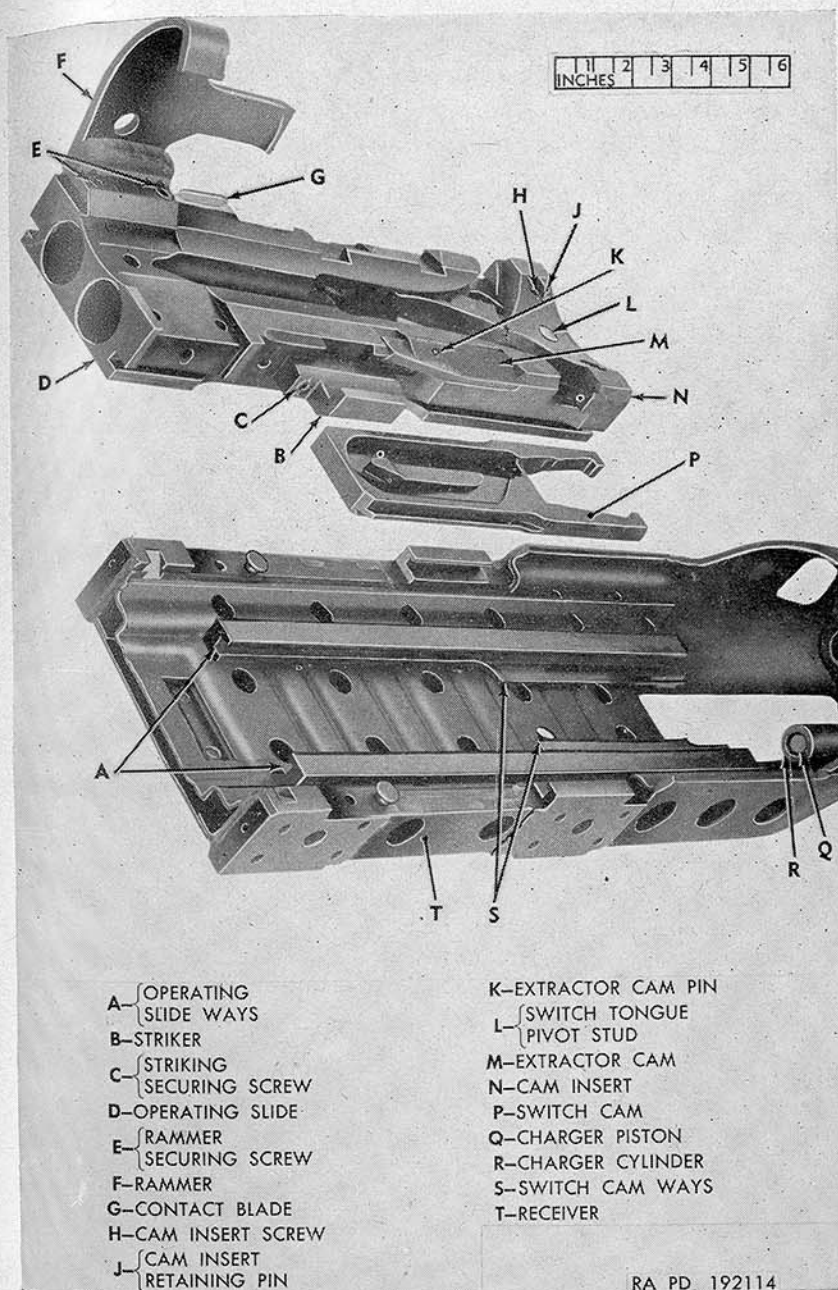


Figure 74. Operating slide and switch cam removed from receiver.

78. Removal

- a. Remove the barrel assembly (par. 51).
- b. Remove the feeder assembly (par. 56).
- c. Remove the operating spring and end plate group (par. 62).
- d. Remove the drum group (par. 66) and the cradle group (par. 72).
- e. Pull the operating slide rearward and out of the operating slide ways. The switch cam will be withdrawn with the operating slide (fig. 74).

79. Disassembly

(figs. 74 and 75)

- a. Remove the rammer by unstaking and removing the three screws which secure it to the operating slide.
- b. Loosen two contact blade set screws located on both ends of the contact blade.
- c. Unscrew the contact blade securing screws and remove the contact blade and blade insulator.
- d. Remove contact blade set screws.
- e. Remove the two insulator bushings from the contact blade.
- f. Remove the two staked striker securing screws.
- g. Push striker downward to remove from dovetail. Use of a brass drift may be necessary.
- h. Drive out the extractor cam pin, and slide the extractor cam from the dovetail in the slide body.
- i. Turn the operating slide over and drive out the switch tongue pivot stud and the two cam insert retaining pins.
- j. Remove the cam insert screws and the cam insert. This frees the switch tongue.

Caution: Do not attempt to remove the cam insert screws before the pins are removed or the serrations on the screw will be damaged.

80. Maintenance

- a. Inspect striker for cracks and signs of mutilation. Look at "dove-tail" grooves for burrs. Inspect threads on striker securing screws for wear and replace if necessary.
- b. Inspect rammer for cracking. Replace screws if necessary.

- c. Check the blade insulator and insulator bushings for serviceability. Be sure the contact surface of the blade is clean and free of rust. Replace securing screws if found unserviceable.

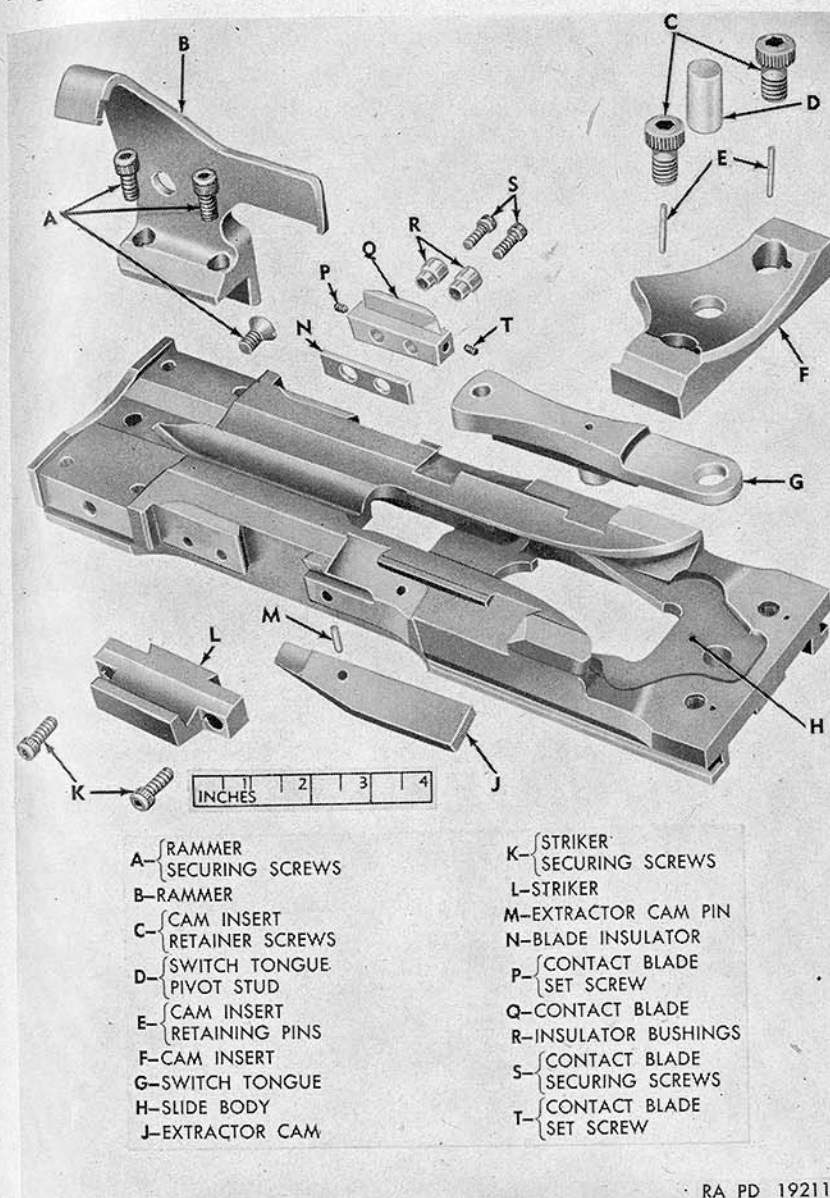


Figure 75. Operating slide—exploded view.

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d. Inspect the outer edge of the extractor cam for wear. Replace the cam pin if it becomes unserviceable.

e. Inspect slide body for obstructions or burrs in the grooves which may interfere with cycling of the slide. Inspect threaded recesses for wear and deformation. Remove all burrs from cam path to prevent interference with the drum roller.

f. Inspect the switch tongue follower (fig. 76) for wear. Notify maintenance personnel if replacement of switch tongue is necessary.

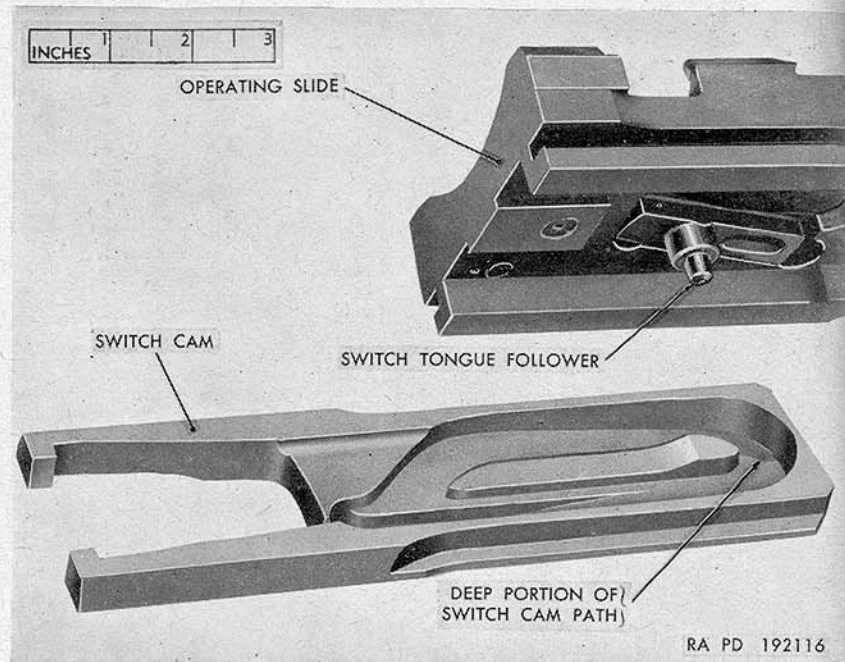


Figure 76. Positioning operating slide in switch cam.

g. Replace cam insert securing screws and retaining pins if unserviceable.

h. Before assembly, clean all parts as directed in paragraph 12 and lubricate. Pay particular attention to the application of lubricant to the grooves in the slide body.

81. Assembly

(figs. 74 and 75)

a. Install the switch tongue, then the cam insert on the slide body, and aline the switch tongue pivot stud holes.

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b. Insert switch tongue pivot stud from top slide of cam insert, and drift into position. The stud should be flush with or slightly below the surface of the cam insert.

c. Turn operating slide over and peen over the edges of the switch tongue pivot stud.

d. Install the cam insert retaining screws, tighten completely, and back off slightly to insure sufficient freedom of movement of the switch tongue.

e. Install the cam insert retaining pins and drift into position. They must seat below the top surface of the cam insert screws.

f. Mount striker in dovetail on the left side of the slide body for a left-hand feed gun and on the right side for right-hand feed.

g. Install the two striker securing screws and stake at two points.

h. Install the extractor cam in the appropriate dovetail on the same side as the striker was installed. Insert extractor cam pin and drift into position, so that it is flush with the top surface of the extractor cam.

i. Partially install the contact blade set screws in the contact blade.

j. Insert the insulator bushings in their holes in the contact blade.

k. Position the blade insulator on the inside surface of the contact blade, and aline the holes in the insulator and blade with the appropriate holes on the slide body. The blade must be secured to the side opposite the striker, to the rear of the grooves provided for the mounting of the striker.

l. Install the contact blade securing screws and tighten the set screws against the insulator bushing, being careful not to penetrate the bushings.

m. Position the rammer at the rear of the operating slide, on the left side for a right-hand feed and right side for left-hand feed.

n. Install the three rammer securing screws and stake each at two points. The flat-head screw is used for securing the side of the rammer to the slide body.

Note. When properly assembled, the striker and extractor cam are on the right side of the operating slide, and the rammer and the contact blade on the left, for right-hand feed or vice versa for left-hand feed.

82. Installation

a. Position the switch tongue follower in the deep portion of the switch cam path (fig. 76).

b. Insert both units into the bottom of the receiver. Move forward until the grooves in the operating slide engage the operating slide-ways (fig. 74).

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- c. Continue to move slide and cam forward, keeping switch cam ahead of operating slide at all times. Move the switch cam into the switch cam ways (fig. 74).
- d. Install cradle group (par. 76).
- e. Install drum group (par. 70).
- f. Replace operating springs and end plate group (par. 64).
- g. Install feeder assembly (par. 60).
- h. Install barrel assembly (par. 54).

Section X. RECEIVER, RECOIL SPRING, GAS TUBE, AND CHARGER GROUPS

83. General

a. The charging system consists of the percussion charger T13, the charger cylinder group, and the charger gas tube assembly connecting the charger to charger cylinder.

b. The charger gas piston and charger gas cylinder (fig. 74) extend through the forward end of the receiver to contact the forward face of the operating slide, when the slide is in battery position. Gases developed by firing one cartridge (par. 48) drive the charger piston rearward against the operating slide. This causes the slide to cycle once, in the same manner as described in paragraphs 37 through 49.

c. The charger is mounted in a bracket at the forward end of the receiver. Provision is made for charging on either the right-hand or left-hand side of gun by repositioning all parts.

d. The receiver is the basic unit of the gun. It is provided with a casting at its forward end which houses the tube (par. 50), cradle bearing (par. 71), recoil spring groups (par. 40b), gas tube (par. 39a), and charger cylinder (b above). The rear area of the receiver serves to accommodate the feeder assembly and the drum cradle. In its base are the operating slide and switch cam ways (fig. 74).

e. The recoil spring groups are housed in the forward casting of the receiver. They absorb both recoil and counterrecoil forces (par. 40b) and limit the recoil distance to approximately one-quarter of an inch.

f. The gas tube group (par. 39a) directs the flow of gas from the tube to the gas cylinder in the drum cradle.

84. Removal

a. Removal of Charger Group.

- (1) Unscrew the upper coupling of the charger gas tube assembly from the charger (fig. 77).

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- (2) Unscrew charger bracket screw and charger securing bracket and remove charger (fig. 78).

Note. For information concerning disassembly, maintenance, and assembly of percussion charger T13, refer to paragraph 87.

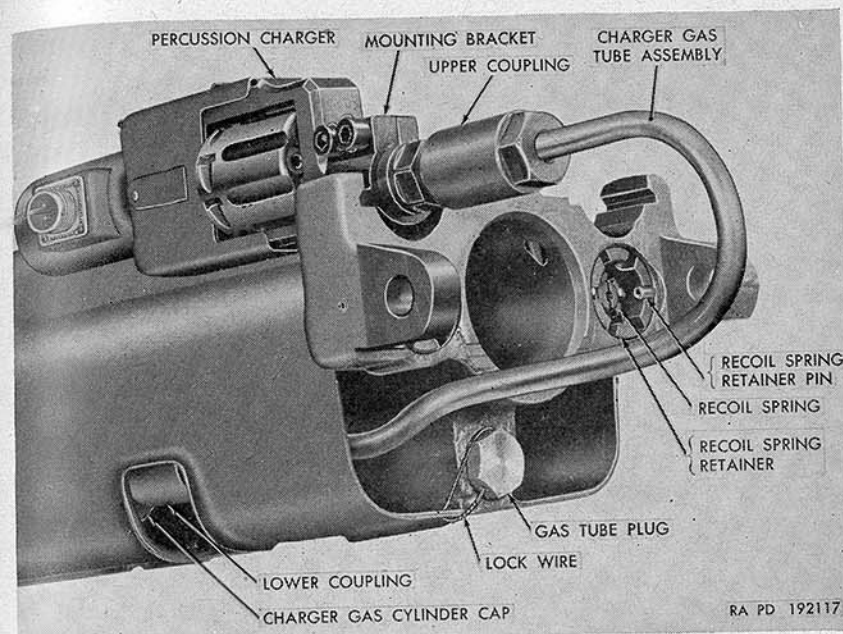


Figure 77. Charger group installed on receiver.

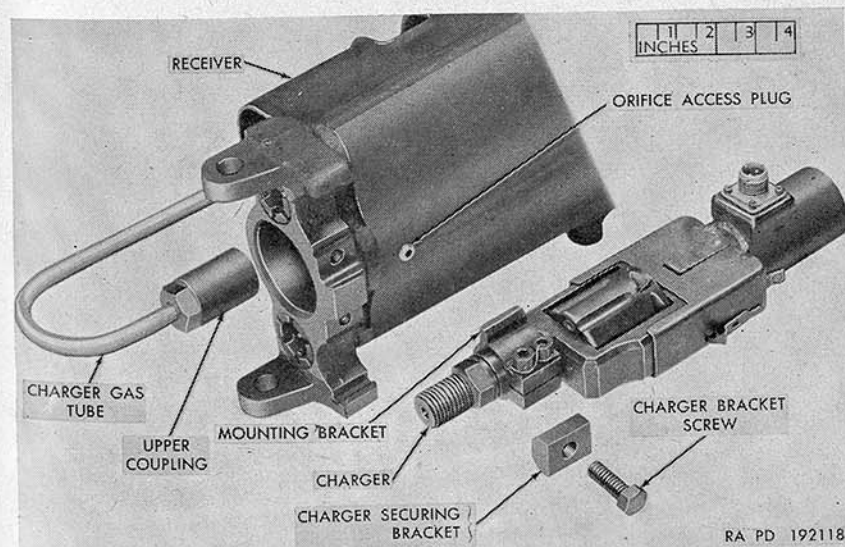


Figure 78. Charger removed from gun.

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- (3) Unscrew the lower coupling from the charger gas cylinder cap (fig. 77) and remove the charger gas tube assembly (fig. 79). Use the charger tube coupling fixed open end wrench 7188574 (fig. 29).

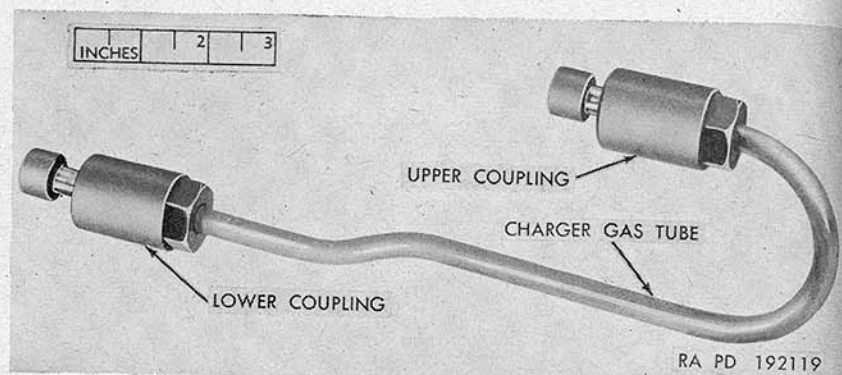


Figure 79. Charger gas tube assembly.

- (4) Unscrew the charger gas cylinder cap (fig. 77).
- (5) Push charger cylinder and piston (fig. 74) out from the rear of the receiver (fig. 80).

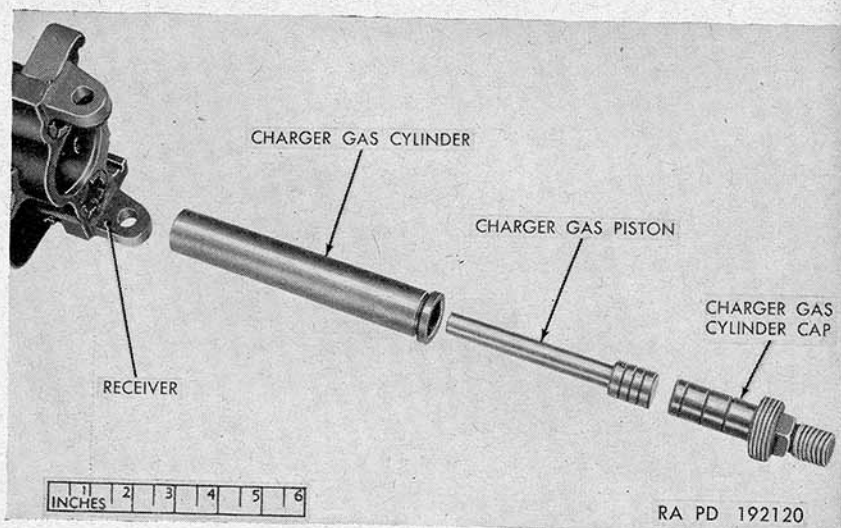


Figure 80. Charger gas cylinder group removed from receiver.

b. Removal of Gas Tube Group.

- (1) Remove the drum cradle group (par. 72).
- (2) Break lockwire and unscrew the gas tube plug (figs. 77 and 81).

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- (3) Push gas tube and adapter outward from inside the receiver.
- (4) Unscrew the orifice access plug to gain access to the receiver orifice (figs. 78 and 81).
- (5) Tap out the receiver orifice.

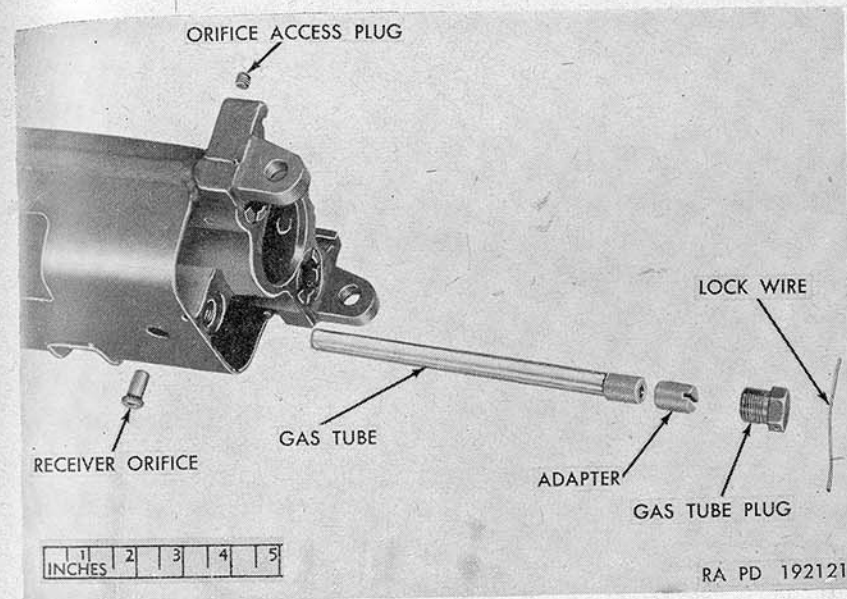


Figure 81. Gas tube group removed from receiver.

c. Removal of Recoil Spring Group.

- (1) Drive out the recoil spring retainer pins (figs. 77 and 82).

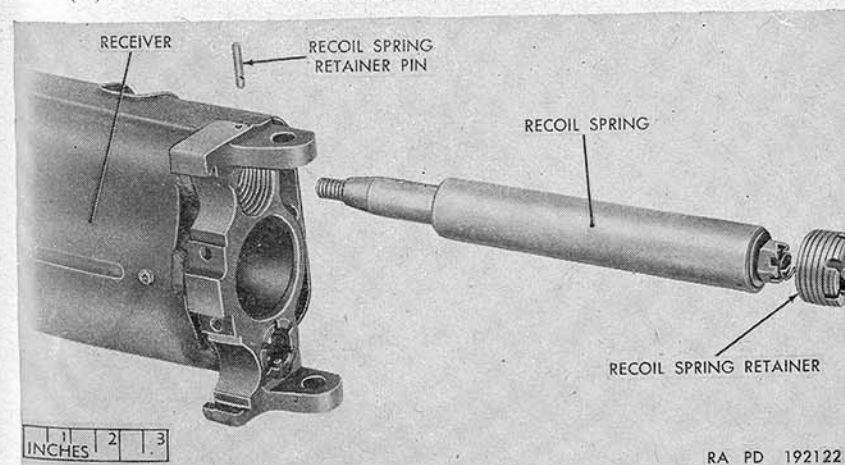


Figure 82. Recoil spring group removed from receiver.

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- (2) Remove the recoil spring retainers (figs. 77 and 82), using the recoil spring retainer face spanner wrench 7188572 (fig. 30).

- (3) Push recoil spring groups outward from within the receiver.

Note. The recoil springs are manufactured units and are not to be disassembled.

d. Receiver Group.

- (1) Drive the securing pins from the feeder mounting pins and receiver (fig. 52).
- (2) Remove feeder mounting pins (fig. 83).

85. Maintenance

a. Charger Group.

- (1) Clean all components which have been exposed to powder gases, including charger gas piston, charger gas cylinder, charger gas cylinder plug, and charger gas tube.
- (2) Inspect charger piston for cracks and burrs. Check movement within the charger gas cylinder.
- (3) For replacement of worn or unserviceable parts, notify maintenance personnel.
- (4) Before installation, apply a coating of light lubricant to the charger gas piston.

b. Gas Tube Group.

- (1) Check receiver orifice for gas erosion.
- (2) Clean all parts to be sure they are free of powder foulings.
- (3) Lubricate external surfaces as directed in paragraph 32*b*.
- (4) When parts become unserviceable, notify maintenance personnel for replacement.

c. Recoil Spring Group.

- (1) Inspect threads of recoil spring retainers.
- (2) Inspect recoil spring shafts for burrs and mutilation of the threads.
- (3) Replace recoil spring retainer pin if found unserviceable. For replacement of the recoil springs or retainers, notify maintenance personnel.
- (4) Lubricate the external surface of recoil springs before installation in the receiver.

d. Receiver Group.

- (1) Inspect operating slideways and switch cam ways (fig. 74).
- (2) Clean the gas tube well and the recoil spring well.
- (3) Replace securing pins if unserviceable.

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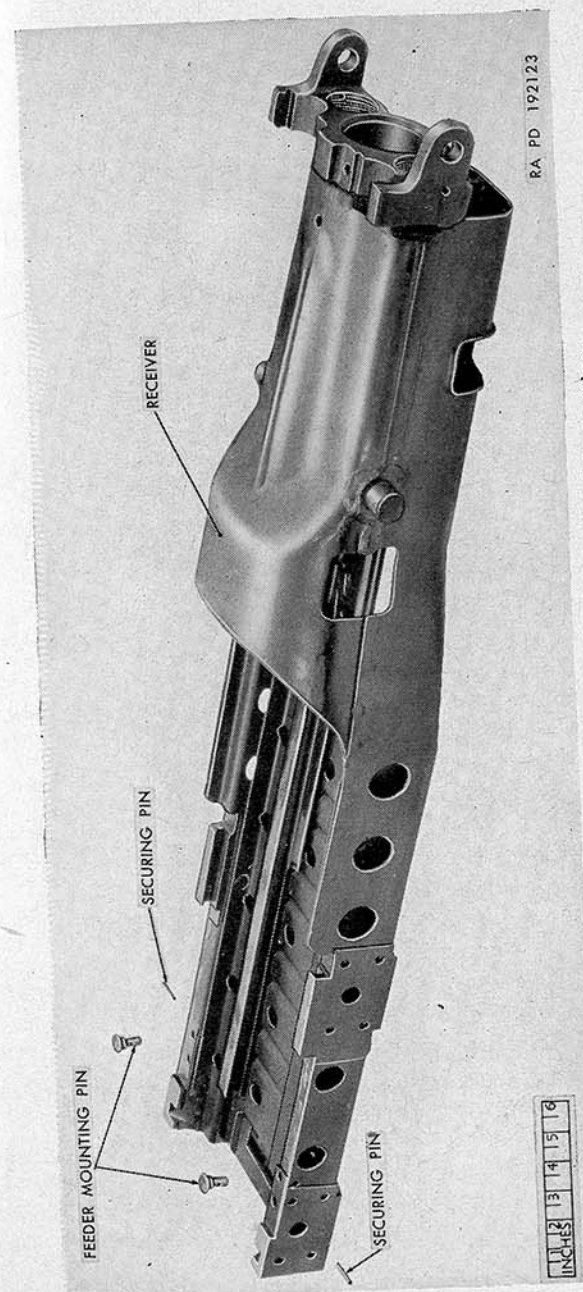


Figure 83. Feeder mounting pins—exploded from receiver.

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- (4) Check for burs in the tube and drum cradle bearing at the forward end of the receiver, and remove if found.
- (5) Before assembly, lubricate the forward bearing, the recoil spring well, the operating slide and switch cam ways, and the "L" slots for the drum cradle.

86. Installation

a. Receiver Group.

- (1) Install feeder mounting pins in holes at rear of receiver (fig. 83).
- (2) Aline hole in mounting pins with those in sides of receiver and drive in the securing pin (figs. 52 and 83).

b. Recoil Spring Group.

- (1) Install recoil springs into holes on each side of tube bearing (fig. 82).
- (2) Screw recoil spring retainers over recoil springs. Tighten hand-tight only, to prevent destroying preload setting of recoil springs (fig. 82).
- (3) Aline nearest notch of recoil spring retainer and drive in pin (figs. 77 and 82).

c. Gas Tube Group (figs. 77 and 81).

- (1) Install receiver orifice in receiver.
- (2) Install orifice access plug in top of receiver.
- (3) Insert gas tube and adapter into opening provided at forward end of receiver. Be sure their flat surfaces are up.
- (4) Install gas tube plug and lockwire.

d. Charger Group (figs. 77 and 80).

- (1) Install the charger gas cylinder into the well provided in the forward end of the receiver on either the right-hand or left-hand side. Be sure it seats in well all the way.
- (2) Install the charger gas piston in the gas cylinder.
- (3) Screw in charger gas cylinder cap.
- (4) Install lower coupling of the charger gas tube assembly in end of the charger gas cylinder cap.
- (5) Position the charger on the forward end of the receiver so that the beveled edges of the mounting bracket are up and one engages the groove provided on the receiver.
- (6) Place the charger securing bracket over the free side of the mounting bracket and install the charger bracket screw.
- (7) Connect the upper coupling to the charger.

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Section XI. PERCUSSION CHARGER T13

87. General

a. The percussion charger T13 is used initially to cycle the weapon for the purpose of bringing live rounds from the feeder mouth to the 6-o'clock firing position (pars. 19 and 38a). It also serves as a means for extracting rounds in the event of a failure to fire.

b. The charger cylinder is chambered to receive eight cal. .30 carbine grenade cartridges. The gases developed by firing these cartridges are directed, by the charger gas tube assembly (fig. 77), to the charger gas cylinder (fig. 74), where they expand against the charger gas piston (fig. 74). This forces the charger gas piston rearward, against the face of the operating slide, causing the operating slide to cycle (par. 39).

c. The charger is solenoid-operated and must be connected to a 24-volt direct-current source in order to function.

88. Removal

Refer to paragraph 84a for instructions on removal of the charger.

89. Disassembly

Note. The charger is to be disassembled for the purpose of lubrication and cleaning only.

- a. Refer to paragraph 17b for removal of the charger cylinder.
- b. Remove lockwire (fig. 84).
- c. Remove the two mounting bracket screws (fig. 84).
- d. Withdraw the mounting bracket (fig. 84).
- e. Unscrew the charger seal retainer and remove the shim and charger seal (fig. 84).
- f. Pry the spindle extension retainer springs (fig. 85) upward, and insert some wedge to hold them in an outward position.
- g. Depress lock latch and withdraw charger frame group from charger housing (fig. 85).
- h. No further disassembly of the charger is allowable on the organizational maintenance level.

90. Maintenance

- a. Remove all rust and clean all accessible surfaces in the charger.
- b. Lubricate the hammer pivot, sear roller pin, and spindle extension.

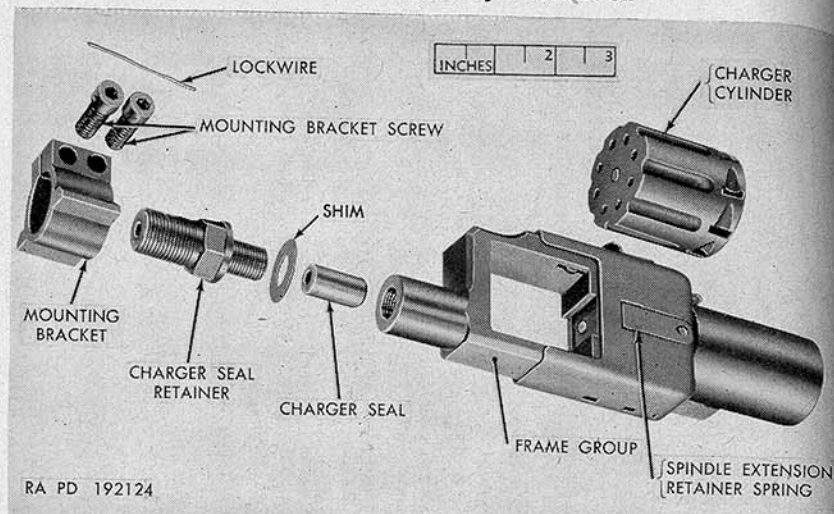


Figure 84. Charger parts—exploded from charger frame group.

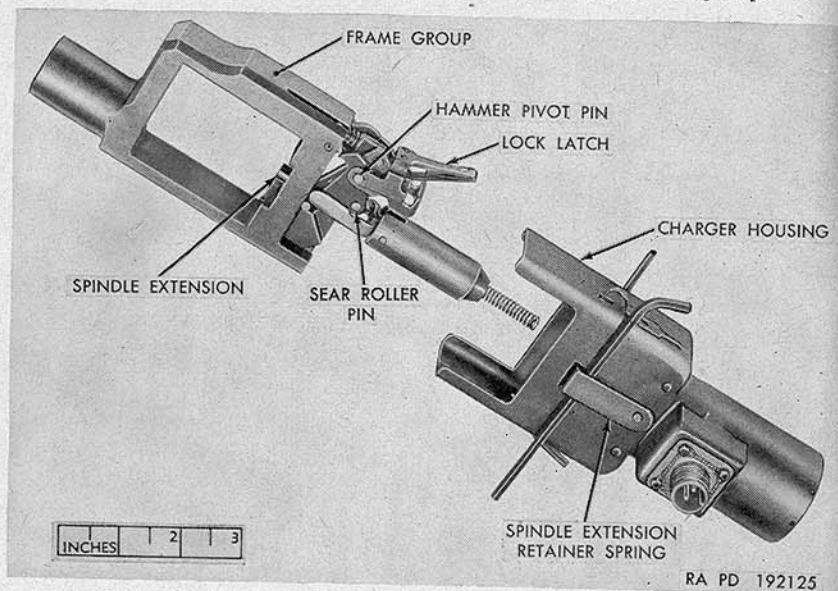


Figure 85. Charger frame group removed from charger housing.

c. If charger does not function properly, notify maintenance personnel.

91. Assembly

a. Insert frame group into charger housing. It is necessary to depress the lock latch in order to insert the frame group.

- b. Release the spindle extension retainer springs.
- c. Insert the charger seal, chamfer end leading, into hole at forward end of the charger frame; then place the shim on the seal retainer.
- d. Screw seal retainer into charger frame; then install charger cylinder (par. 17b (3)).
- e. Install mounting bracket over forward end of frame, so that the chamfer on the wing edges is up.
- f. Clamp in place by installing the two mounting bracket screws.
- g. Lock-wire the screws.

92. Installation

Refer to paragraph 86d for installation of charger on receiver.

CHAPTER 4

FIELD MAINTENANCE INSTRUCTIONS

Section I. GENERAL

93. Scope

This chapter contains information and instructions for use by personnel responsible for field maintenance only. It contains information on maintenance which is beyond the scope of the tools, equipment, or supplies normally available to using organizations. This chapter does not contain information which is intended primarily for the using organization, since such information is available to field maintenance personnel in chapter 3.

94. Field Maintenance Allocation

The publication of these field maintenance instructions is not to be construed as authority for the performance by field maintenance personnel of those functions which have been restricted to depot shops and arsenals. Complete disassembly and rebuild of these weapons is restricted to depot maintenance which is the responsibility of the Ordnance Corps.

Section II. PARTS, SPECIAL TOOLS, AND EQUIPMENT FOR FIELD MAINTENANCE

95. General

Tools, equipment, and maintenance parts over and above those available to the using organization are supplied to field maintenance units for maintaining and repairing the matériel.

96. Parts

Field maintenance parts will be listed in the pertinent Department of the Army Supply Catalog covering this matériel. See ORD 1 for availability.

97. Common Tools and Equipment

Standard and commonly used tools and equipment having general application to this matériel are listed in ORD 6 SNL J-8, Section 6 and ORD 6 SNL J-10, Section 2, and are authorized for issue by T/O & E. They are not specifically identified in this manual.

98. Special Tools and Equipment

Certain tools and equipment specially designed for field maintenance, repair, and general use with the matériel are listed in table IV, for information only. This list is not to be used for requisitioning replacements.

Table IV. Special Tools and Equipment for Field Maintenance

Item	Identifying No.	References		Use
		Fig.	Par.	
BRUSH, bore, 20-mm, M25.	7225087	---	35c (1)(a)---	To clean 20-mm bore.
BRUSH, cleaning, cal. .60--	7161760	---	35c (1)(a)---	To clean cal. .60 bore.
CASE, cleaning rod, cal. .60.	7161757	---	35c (1)(a)---	Cover for cal. .60 cleaning rod.
COMPRESSOR, assembling, drum roller retainer.	7188575	86	119a-----	To replace drum roller retainer.
COMPRESSOR, disassembling, drum roller retainer.	7188577	---	116c (4)-----	To remove drum roller retainer.
COMPRESSOR, spring, drum shaft and barrel latches.	7188578	25	75g (6)-----	To remove barrel latch assembly and drum shaft latch assembly.
HOOK, rammer-----	7188569	27	19b (4)-----	To cycle gun manually.
HOOK, lifting drum-----	7188573	26	66d-----	To remove drum during disassembly.
KNOCKOUT, drum seal, 20-mm.	7188571	87	116b-----	To force out drum seals.
KNOCKOUT, drum seal, cal. .60.	7188570	88	116b-----	To force out drum seals.
ROD, cleaning, jointed, cal. .60.	7161750	---	35c (1)(a)---	To attach to brush for bore cleaning.
STAFF, cleaning, 20-mm, M13.	5570631	---	35c (1)(a)---	To attach to brush for bore cleaning.
TOOL, operating spring, removing or replacing.	7188576	28	62a-----	To remove or replace operating spring.
WRENCH, open end, fixed, charger tube coupling.	7188574	29	84a (3)-----	To remove charger cylinder cap.
WRENCH, spanner, face, firing pin retainer.	7185995	89	122b (1)-----	To remove firing pin retainer.
WRENCH, spanner, face, recoil spring retainer.	7188572	30	84c (2)-----	To remove recoil spring retainer.
WRENCH, spanner, pin, gas cylinder plug.	7188579	31	73g (2)-----	To remove gas cylinder plug.

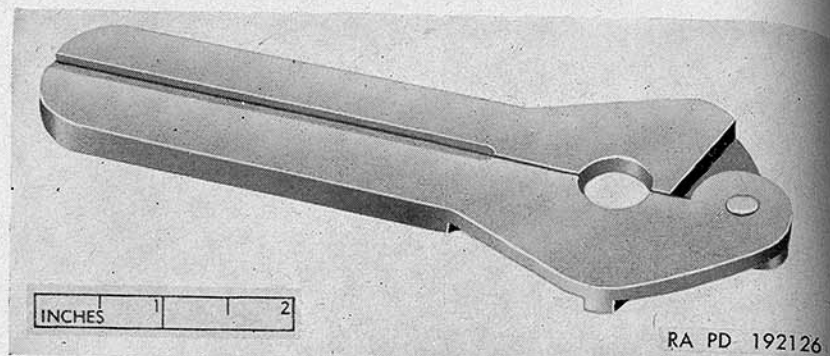


Figure 86. Drum roller retainer assembling compressor 7188575.

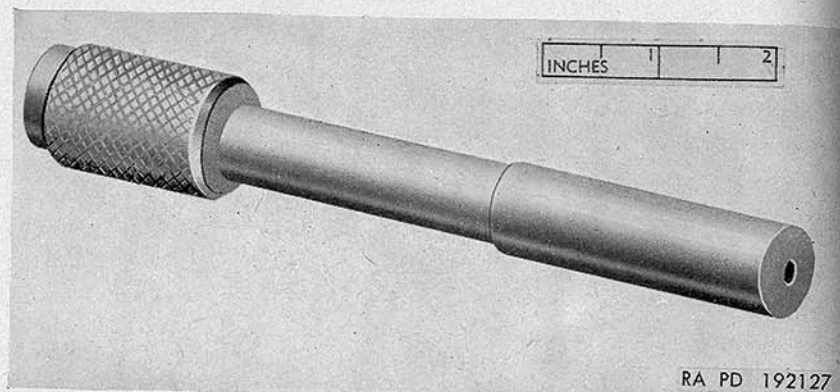


Figure 87. 20-mm drum seal knockout 7188571.

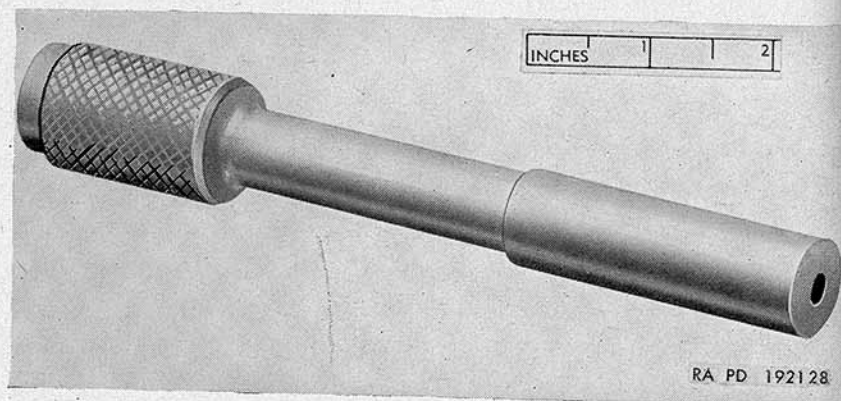


Figure 88. Cal. .60 drum seal knockout 7188570.

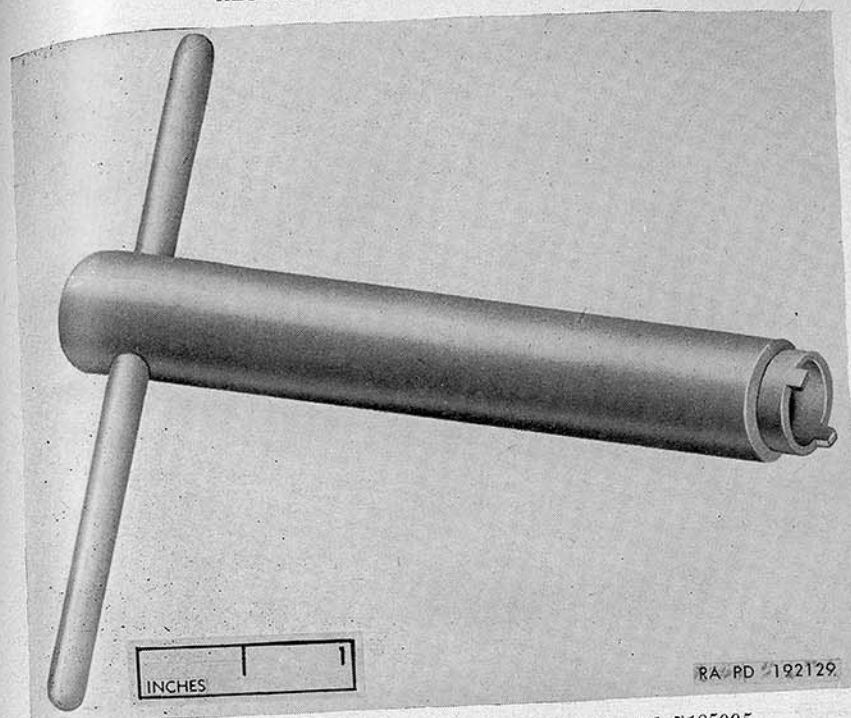


Figure 89. Firing pin retainer face spanner wrench 7185995.

Section III. INSPECTIONS

99. General

a. Scope. This section provides specific instructions for the technical inspection by field maintenance personnel of matériel either in the hands of the user or when received for repair in maintenance shops. It also briefly describes the in-process inspection of matériel during repair and final inspection after repair has been completed. Trouble shooting information is incorporated wherever applicable as a normal phase of inspection.

b. Purpose of Inspections. Inspections are made for the purposes of (1) determination of the condition of an item as to serviceability, (2) determination of incipient failure, (3) the assurance of proper application of maintenance policies at prescribed levels, and (4) the ability of a unit to accomplish its maintenance and supply missions.

c. Types of Inspections. In general, the following categories of inspection are performed by field maintenance personnel.

(1) *Overall inspection.* This is a periodic overall inspection performed on guns in the hands of the using organization and

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an inspection performed by field maintenance personnel when guns are returned for repair.

- (2) *In-process inspection.* These are inspections performed in the process of repairing (field maintenance) guns as described further in this chapter. This is to insure that all parts conform to the prescribed standards, that the workmanship is in accordance with approved methods and procedures, and that deficiencies not disclosed by overall inspections are found and corrected.
- (3) *Final inspection.* This is an acceptance inspection performed by a final inspector, after repair has been completed, to insure that the gun is acceptable for return to using organization.
- (4) *Spot-check inspection.* This is a periodic overall inspection performed on only a percentage of the guns in each unit to determine the adequacy and effectiveness of organizational maintenance.

100. Overall Inspection

a. General.

Warning: Before starting a technical inspection, be sure to clear the weapon. Do not touch the firing mechanism until the weapon has been cleared. Inspect the chamber to insure that it is empty and check to see that no ammunition is in a position to be introduced. Avoid having live ammunition in the vicinity of the work.

(1) Preparatory procedures.

- (a) Check to see whether the weapon has been cleaned of all corrosion-preventive compound, grease, excessive oil, dirt, or foreign matter which might interfere with proper functioning or obscure the true condition of the parts.
 - (b) Make an overall inspection of the weapon for general appearance, condition, and operation. Manually operate the gun using dummy cartridges.
- (2) *Inspection guide.* Table V lists the prescribed standards which are used as a guide for the inspection of weapons.

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Table V. Inspection Guide

Point to be inspected	Overall inspection	Final inspection field maintenance
FINISH-----	Intact, clean, and free of rust.	Intact, clean, and free of rust.
BORE-----	Free of rust and foreign matter.	Fine uniform pitting, but with sharp lands and grooves.
DRUM SEALS AND DRUM CHAMBER. FIRING CIRCUIT----	Free of rust, rust spots, and foreign matter. Contact blades and nylon insulator intact.	Free of rust, rust spots, and foreign matter. Contact blades and nylon insulator intact.
FIRING PIN AND AN- VIL.	Free of rust and foreign matter; intact insulator; proper spring action of firing pin.	Free of rust and foreign matter; intact insulator; proper spring action of firing pin.
EXTRACTOR-----	Splines free of burrs and pawl of chips; cam surface free from distortion, cracks, or wear; extractor spring and spring screw serviceable.	Splines free of burrs and pawl of chips; cam surface free from distortion, cracks, or wear; extractor spring and spring screw serviceable.
ANTIDouble FEED--	Contact in place; spring free of cracks and deformation.	Contact in place; spring free of cracks and deformation.
OPERATING SLIDE--	Striker free of cracks, burrs, and signs of mutilation; threads free of wear. Rammer free of cracks; contact blades clean and free of rust.	Striker free of cracks, burrs, and signs of mutilation; threads free of wear. Rammer free of cracks; contact blades clean and free of rust.

b. *Inspection of Matériel in the Hands of the Using Organization.* Matériel to be inspected includes organizational spare parts and equipment and stocks of cleaning and preserving materials. In the course of this inspection, the inspector will accomplish the following:

- (1) Determine serviceability, i. e., the degree of serviceability, completeness, and readiness for immediate use, with special reference to safe and proper functioning of the matériel. If the matériel is found serviceable, it will be continued in service. In the event it is found unserviceable or incipient failures are disclosed, the deficiencies will be corrected on the spot or advice given as to corrective measures when appropriate.

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plicable, or if necessary, the matériel will be tagged for delivery to, and repaired by field maintenance personnel.

- (2) Check causes of mechanical and functional difficulties that the user may be experiencing and also for apparent results of lack of knowledge, misinformation, neglect, improper handling and storage, security, or preservation.
 - (3) Check on application of all authorized technical orders, that no unauthorized alterations have been made, or that work beyond the authorized scope of the unit is being attempted.
 - (4) Instruct the using personnel in proper preventive maintenance procedures where found inadequate.
 - (5) Check on completeness of the organizational maintenance allowances and procedures for obtaining replenishments.
 - (6) Check conditions of storage of general supplies and ammunition.
 - (7) Initiate a thorough report on matériel awaiting repair, with reasons therefore, for further appropriate action.
 - (8) The inspector should report to the responsible officer any carelessness, negligence, unauthorized modifications, or tampering. This report should be accompanied by recommendations for correcting the unsatisfactory conditions.
- c. *Inspection of Matériel in Field Maintenance Shops.*
- (1) Information in b above applies also to the inspection of matériel received in field maintenance shops.
 - (2) Inspect matériel for repairs to be tagged for depot maintenance.
 - (3) Table VI lists malfunctions, probable causes, and corrective action which pertain to field maintenance.

Table VI. Trouble Shooting

Malfunction	Probable causes	Corrective action
Failure to fire chambered round-----	Firing pin stuck in anvil. Firing pin has become permanently set. Failure of contact blade of operating slide to engage firing circuit contacts.	Disassemble and clean all parts (par. 122b). Replace firing pin spring (par. 122b). Repair or replace firing circuit (par. 73b).
Premature firing-----	Female contacts of firing circuit become shorted.	Replace firing circuit (par. 73b).
Failure to extract-----	Worn extractor cam-----	Replace cam (par. 79h).

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Section IV. BARREL ASSEMBLY

101. Removal

Refer to paragraph 51 for the removal of the barrel assembly.

102. Disassembly

Disassembly of the barrel assembly is prohibited.

103. Inspection

Refer to paragraph 53 for maintenance to be performed by maintenance personnel. Replace barrel assembly if necessary.

104. Installation

Refer to paragraph 54 for the installation of the barrel assembly.

Section V. FEEDER ASSEMBLY

105. Removal

Refer to paragraph 56 for the removal of the feeder assembly.

106. Disassembly

- a. Refer to paragraph 57 for the disassembly of the feeder within the scope of organizational maintenance.
- b. Use a drift and drive out the feeder lock housing and the feeder shaft lock housing (fig. 90).
- c. Pull out the locating pins in the forward end of the feeder frame (fig. 90).

107. Inspection

Refer to paragraph 58 for the maintenance to be performed by maintenance personnel.

108. Repair

The repair of the feeder assembly which is the responsibility of field maintenance personnel consists of replacing those parts which are not serviceable and not allocated to organizational maintenance.

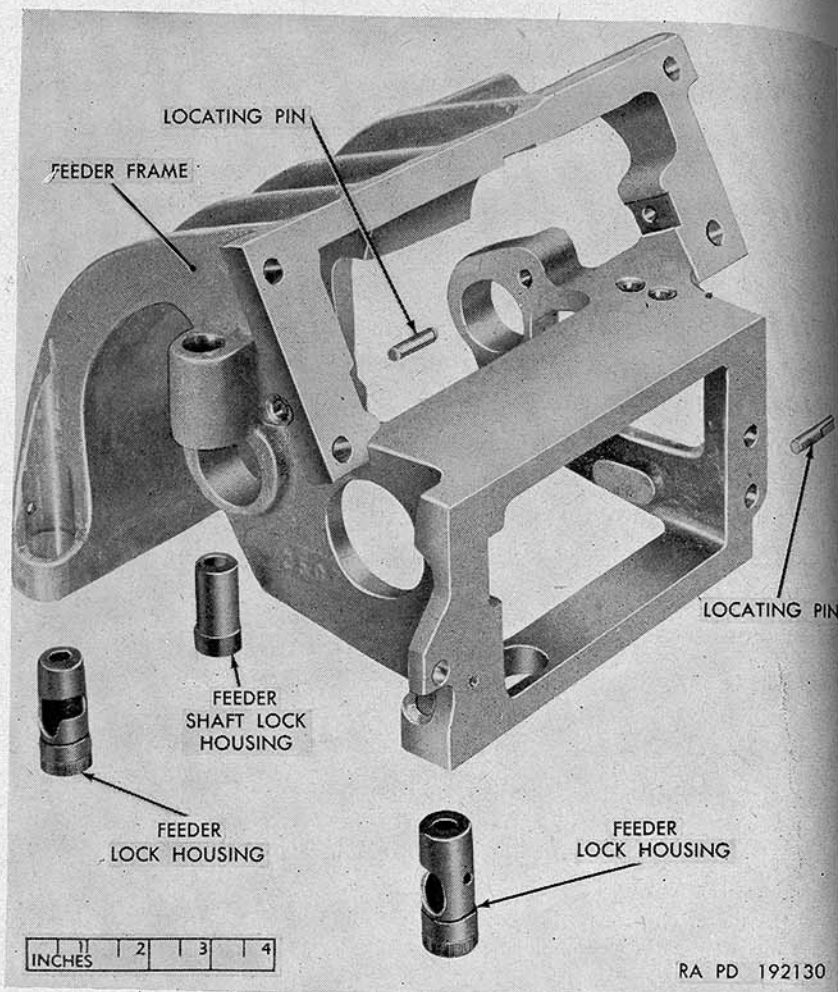


Figure 90. Feeder frame assembly—exploded view.

109. Assembly

a. Install the two lock housings and one shaft lock housing in their proper position on the feeder frame (fig. 90). Drive them into place, being sure that the lock housings are flush with the lower surface of the feeder frame.

b. Install the locating pins in the forward end of the feeder frame. The flats must be exposed and in a vertical position.

c. Refer to paragraph 59 for the completion of the assembly procedure.

110. Installation

Refer to paragraph 60 for the installation of the feeder assembly.

Section VI. OPERATING SPRING AND END PLATE GROUP

111. Removal

Refer to paragraph 62 for the removal of the operating spring and end plate group.

112. Inspection

Refer to paragraph 63 for maintenance performed by maintenance personnel.

113. Repair

Repair of the operating spring and end plate group consists of replacing all parts that are unserviceable.

114. Installation

Refer to paragraph 64 for the installation of the operating spring and end plate group.

Section VII. DRUM GROUP

115. Removal

Refer to paragraph 66 for the removal of the drum group.

116. Disassembly

a. Refer to paragraph 67 for the disassembly permitted by organizational maintenance.

b. During disassembly, if drum seals should jam, force them out with a 20-mm drum seal knockout 7188571 (fig. 87) for the T160, or a cal. .60 drum seal knockout 7188570 (fig. 88) for the T130.

c. To remove the drum rollers, perform the operations in (1) through (4) below.

- (1) Bevel one end of three pieces of drill rod approximately 1.5 inches long and 0.10 inch in diameter.
- (2) Tap the bevel ends of the drill rod into the three notches in the top of the drum roller. This forces the roller retainer inward (fig. 91).

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- (3) Using a screw driver, pry upward on the roller to lift them from their roller trunnions (fig. 91).
- (4) Remove the roller retainers (fig. 92) with a drum roller retainer disassembling compressor 7188577 (table IV, par. 98).

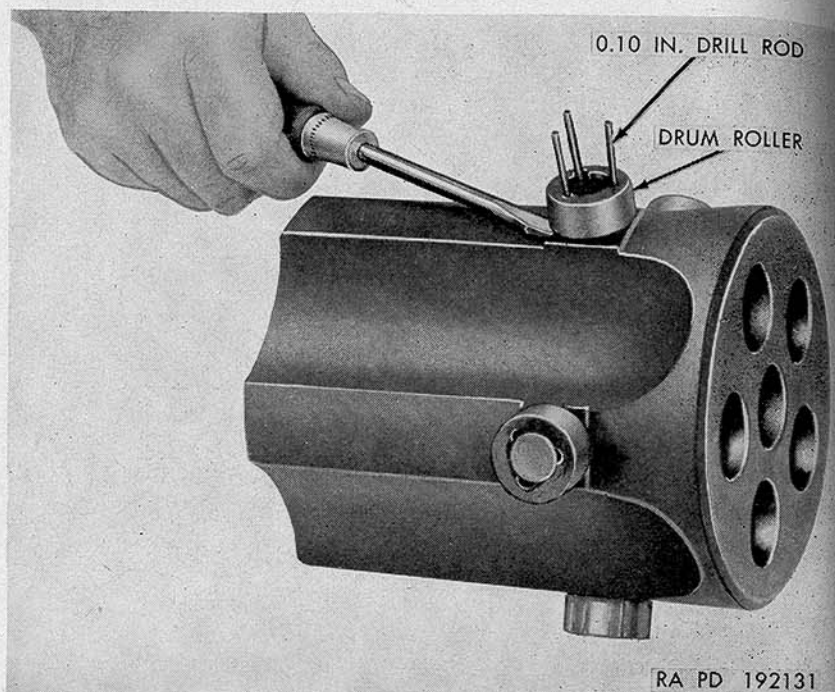


Figure 91. Removal of drum rollers.

d. Using an arbor press, force the drum bushing (fig. 92) out from the drum body.

117. Inspection

- a. Refer to paragraph 68 for the inspection performed by organizational maintenance personnel.
- b. Inspect the drum roller trunnions for signs of cracking.
- c. Check the inside of the drum rollers for wear in the roller retainer groove.
- d. Check condition of roller retainers as they are easily distorted when removing them from the drum trunnions.

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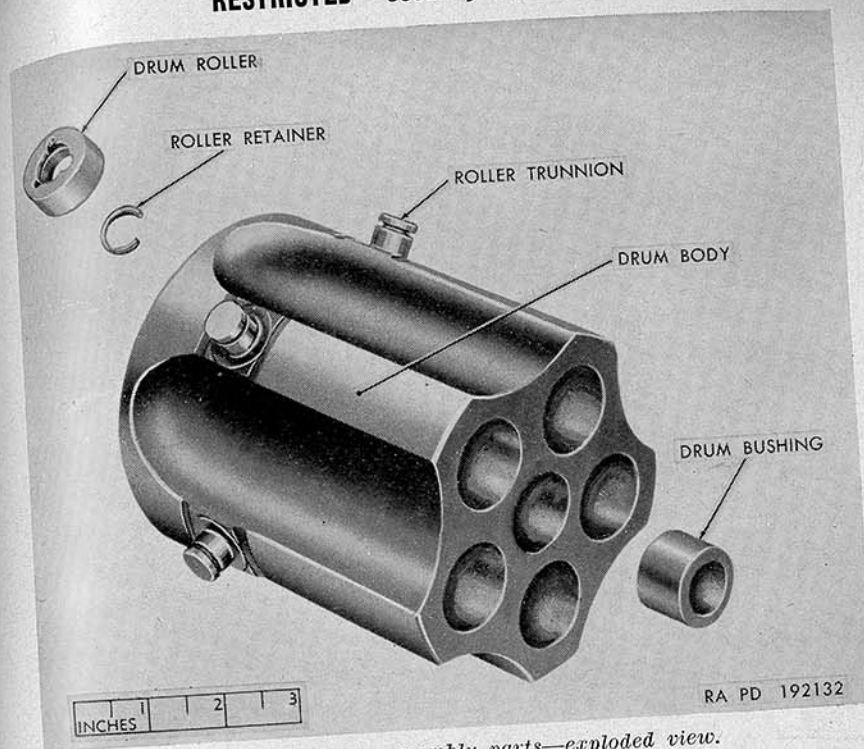


Figure 92. Drum assembly parts—exploded view.

118. Repair

Repair of the drum assembly consists of replacing all parts that are unserviceable.

119. Assembly

- a. Position one roller retainer in each groove of the roller trunnions (fig. 92) with a drum roller retainer assembling compressor (fig. 86).
- b. Place a roller over the trunnion and press downward as far as possible.
- c. Install the three pieces of drill rod (par. 116) to compress the roller all the way on the roller trunnion (fig. 91).
- d. Using an arbor press, install the drum bushing.

120. Installation

Refer to paragraph 70 for the installation of the drum assembly, which is within the scope of organizational maintenance.

Section VIII. CRADLE GROUP

121. Removal

Refer to paragraph 72 for the removal of the cradle group.

122. Disassembly

a. Refer to paragraph 73 for the disassembly of drum cradle group components.

b. To disassemble the firing pin and anvil assembly perform the operations in (1) through (4) below.

- (1) Using the firing pin retainer face spanner wrench (fig. 89), remove the firing pin and anvil retainer, threaded into rear of the firing pin and anvil (fig. 93).
- (2) Pull out the firing pin extension and remove the front insulator and the insulator spacer.
- (3) Withdraw the firing pin spring and firing pin.
- (4) Further disassembly of the anvil assembly is prohibited.

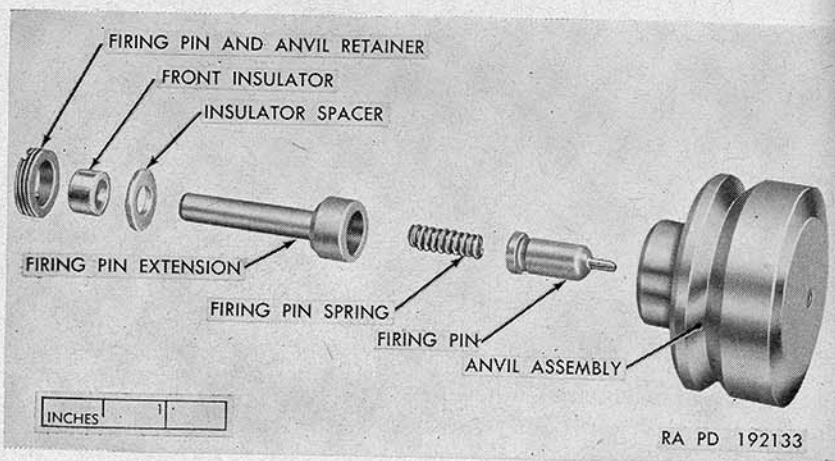


Figure 93. Firing pin and anvil parts—exploded view.

123. Inspection

a. Refer to paragraph 74 for the inspection performed by organizational maintenance personnel.

b. Check all parts of the firing pin and anvil for rust and dirt.

c. Inspect insulator for cracks and deterioration.

d. Make all electric circuit tests as directed in paragraph 127.

124. Repair

The repair of the drum cradle components is limited to the replacement of all worn or unserviceable parts.

125. Assembly

a. Install the firing pin spring in the firing pin (fig. 93) and insert both units into the anvil assembly.

b. Install the front insulator on the firing pin extension (fig. 93).

c. Install the insulator spacer on the front insulator and position against the shoulder of the firing pin extension (fig. 93).

d. Insert the firing pin extension over the firing pin spring (fig. 93).

e. Install firing pin and anvil retainer over firing pin extension and screw into rear face of anvil assembly.

f. Refer to paragraph 75 to complete the assembly of the drum cradle group.

126. Installation

Refer to paragraph 76 for the installation of the cradle group.

127. Testing Electrical Firing Circuit

a. *200-Volt Electrical Source.* A 200-volt direct-current source is applied to the electrical firing circuit when the gun is being fired. The current is conducted through the connector to one of the contacts on the nylon insulator below the drum cradle.

b. *Course of the Current.* When the contact blade is in place, the current passes through it to the other contact (fig. 94). It then goes to one of the contacts on the antidouble feed contact box. With the contact of the antidouble feed in place, the current is directed to the firing pin, then to the cartridge primer. The primer is grounded to the cartridge case and thereby to the drum and gun, completing the circuit back to the connector which is also grounded to the gun. To test the continuity of the circuit described, a series of checks are given below. The use of an ohmmeter is necessary for performing the test. The step by step checking of components of the circuit, and then the completely assembled circuit, assures the finding of the source of trouble immediately.

c. *Firing Pin and Anvil Assembly.* Before installation, check for short circuit by touching one pole of the ohmmeter to the firing pin extension and the other to the face of the anvil. No deflection of

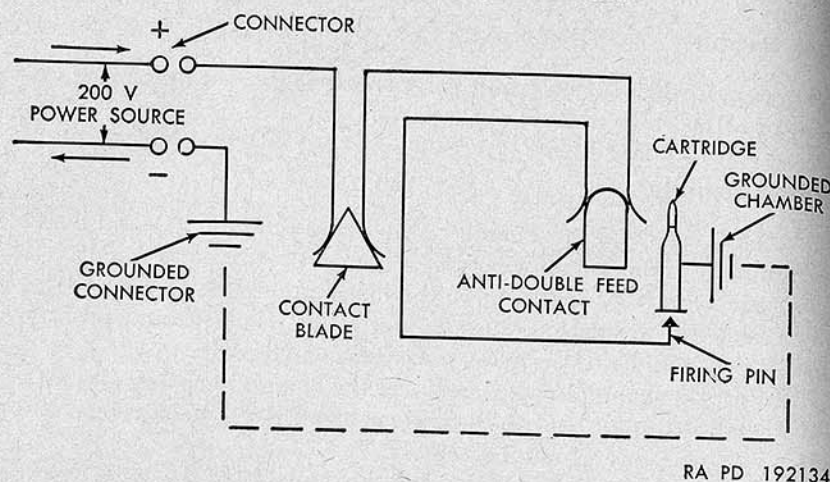


Figure 94. Circuit diagram of gun.

the indicator needle (infinite resistance) should occur. If needle deflects, it indicates the failure of one of the insulators or the liner in the anvil assembly. When the firing pin is touched by the second pole of the ohmmeter, deflection of the needle should occur.

d. Firing Circuit. Before installing the firing circuit on the drum cradle perform the operations in (1) through (3) below:

- (1) Touch one pole of the ohmmeter to the center prong of the electric connector (fig. 4). With the other pole, touch each of the contacts on the contact blade below the nylon insulator (fig. 69). The indicator needle should deflect only when one of the contacts is touched and not when the second is contacted. Current indication on the meter dial for both contacts shows failure of the internal insulators.
- (2) Short the blade contacts by inserting a screwdriver between them. Touch one pole of the ohmmeter to the center prong of the connector and other to the contacts of the antidouble feed contact box (fig. 67). The needle should deflect on the meter dial only when one contact is touched. If the needle deflects when either contact is touched, a complete circuit is indicated from the connector through the blade contacts to the antidouble feed contacts (fig. 94).
- (3) Close the antidouble feed contacts and the blade contacts, using a screwdriver blade. Contact the center prong of the electric connector with one pole of the ohmmeter. Touch the contact point (fig. 68) on the junction box with the other

pole. The needle should deflect indicating a complete circuit from receptacle to contact point.

e. The Complete Firing Circuit (Assembled to Gun). To check the complete firing circuit from connector to the firing pin perform the operations in (1) through (6) below.

- (1) Assemble (par. 75) and install (par. 76) the cradle group.
- (2) Move the operating slide into battery, placing the contact blade between the contacts on the nylon bushing below the drum cradle.
- (3) Be sure the antidouble feed contact is between the contacts of the antidouble feed contact box.
- (4) Touch the center prong of the electric connector with one pole of the ohmmeter. With the other pole, touch the tip of the firing pin. The needle of the ohmmeter should deflect, indicating a complete circuit from connector to firing pin.
- (5) With one pole of the ohmmeter again touching the center prong of the connector, touch the second pole to the connector of the firing circuit unit. The needle should not deflect on the ohmmeter dial.
- (6) Position a dummy round into the 6-o'clock firing position. Repeat the operation in (5) above. A deflection of the needle should occur, indicating the complete circuit from connector, through contact blade, antidouble feed contact, firing pin, cartridge, and then to ground.

Section IX. OPERATING SLIDE AND SWITCH CAM

128. Removal

Refer to paragraph 78 for the removal of the operating slide and switch cam.

129. Disassembly

a. Refer to paragraph 79 for the disassembly of the operating slide which is allowable at the organizational level of the maintenance. This will be complete disassembly of the operating slide, except for the switch tongue assembly.

b. Using a drift, drive out the switch tongue follower from its well in the switch tongue body (fig. 95).

c. Remove the follower spring.

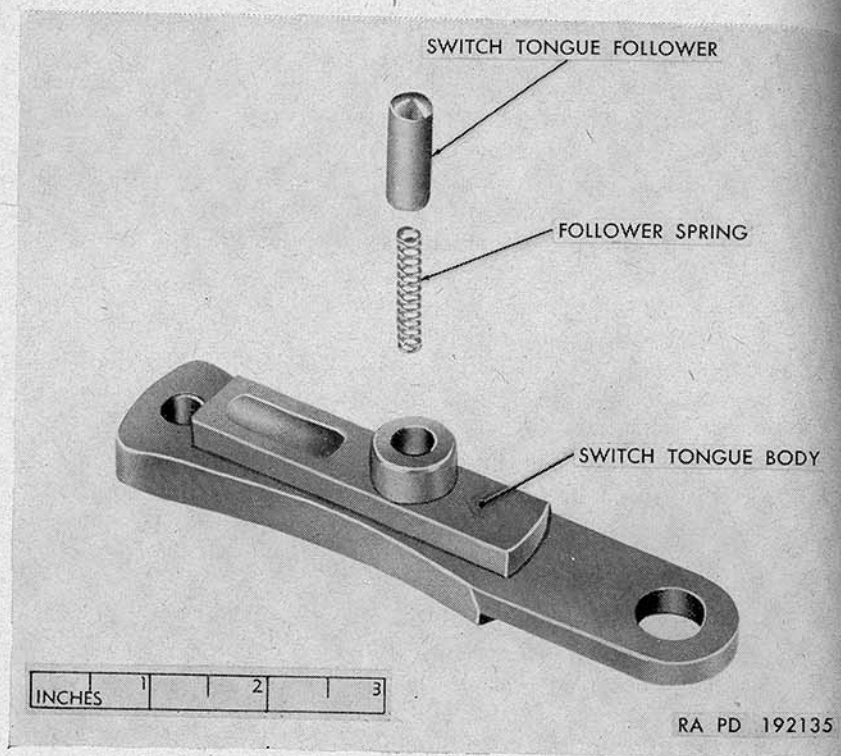


Figure 95. Switch tonnage assembly—exploded view

130. Inspection

- Refer to paragraph 80 for the inspections performed by organizational maintenance personnel.
- Inspect the switch tongue follower for wear.
- Check physical condition of follower spring.

131. Repair

The repair to the operating slide and switch cam group consists chiefly of replacing those parts which are worn and unserviceable.

132. Assembly

- Insert switch tongue follower spring in the switch tongue follower (fig. 95).
- Place the follower and spring over the well provided in the switch tongue body.

- Force the switch tongue follower into the well, until the raised portion of the follower has cleared the smaller diameter of the well (interference fit). When seated properly, the follower can be pushed inward against the spring freely and when released will not be driven out.
- Refer to paragraph 81 for the completion of the assembly procedure.

133. Installation

Refer to paragraph 82 for installation of the operating slide and switch cam.

Section X. RECEIVER, RECOIL SPRING, GAS TUBE, AND CHARGER GROUPS

134. Disassembly

Refer to paragraph 84 for the disassembly of the receiver, recoil springs, gas tube, and charger groups.

135. Inspection

Refer to paragraph 85 for maintenance to be performed by organizational maintenance.

136. Repair

Repair of the receiver, recoil spring, gas tube, and charger groups consists chiefly of the replacement of all unserviceable parts.

137. Installation

Refer to paragraph 86 for the installation of the receiver, recoil spring, gas tube, and charger groups.

Section XI. PERCUSSION CHARGER T13

138. Removal

Refer to paragraph 84 for the removal of the percussion charger T13.

139. Disassembly

Refer to paragraph 89 for the disassembly of the charger group permitted by organizational maintenance personnel.

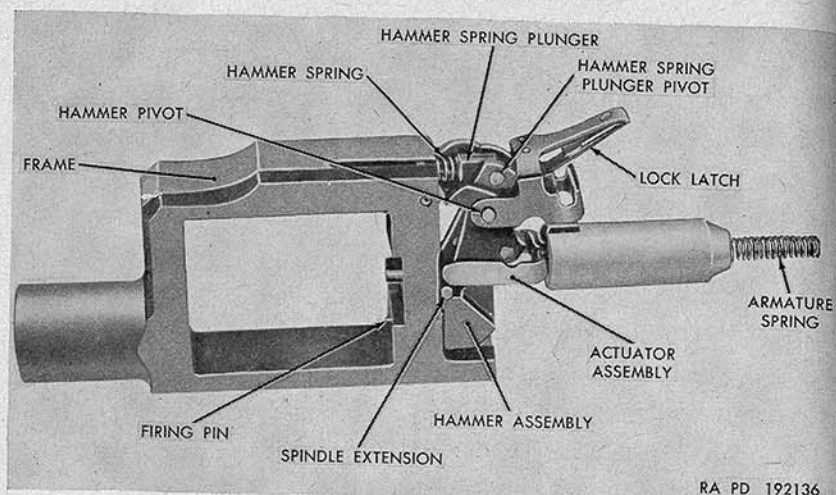


Figure 96. Charger frame group.

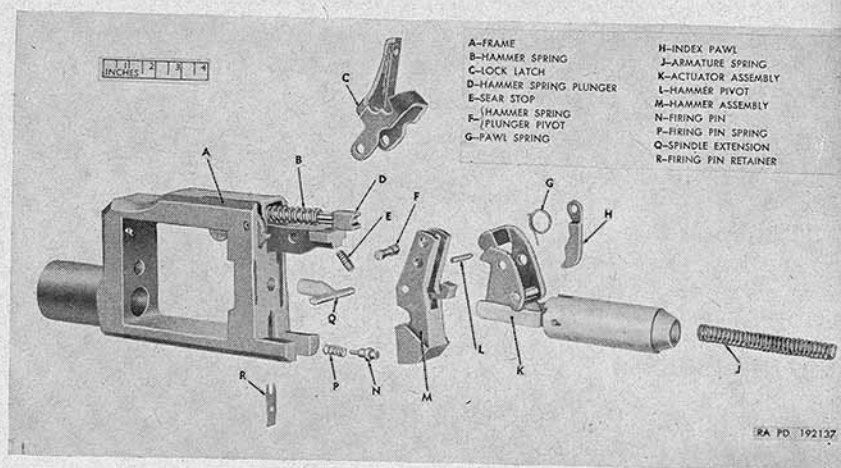


Figure 97. Charger frame group—exploded view.

a. *Disassembly of Frame Group* (figs. 96 and 97).

- (1) Withdraw the actuator spring from the actuator.
- (2) Depress the hammer spring by pushing the hammer spring plunger into the frame. This will take the pressure off the hammer spring plunger pivot.
- (3) Drive out the hammer spring plunger pivot.
- (4) Raise the lock latch to clear leaf springs of plunger and spring. Release plunger and spring slowly and remove from frame.

- (5) Drift out the hammer pivot to free the lock latch, hammer assembly, and actuator assembly.
- (6) Remove index pawl and pawl spring from actuator assembly.
- (7) Unscrew and remove sear stop.
- (8) Withdraw the spindle extension.
- (9) Push firing pin into frame below firing pin retainer. Slide out firing pin retainer and withdraw firing pin and firing pin spring.

b. *Disassembly of Hammer Assembly* (fig. 98).

- (1) Drift sear pivot from the hammer.
- (2) Remove the sear, sear plunger, and sear plunger spring.

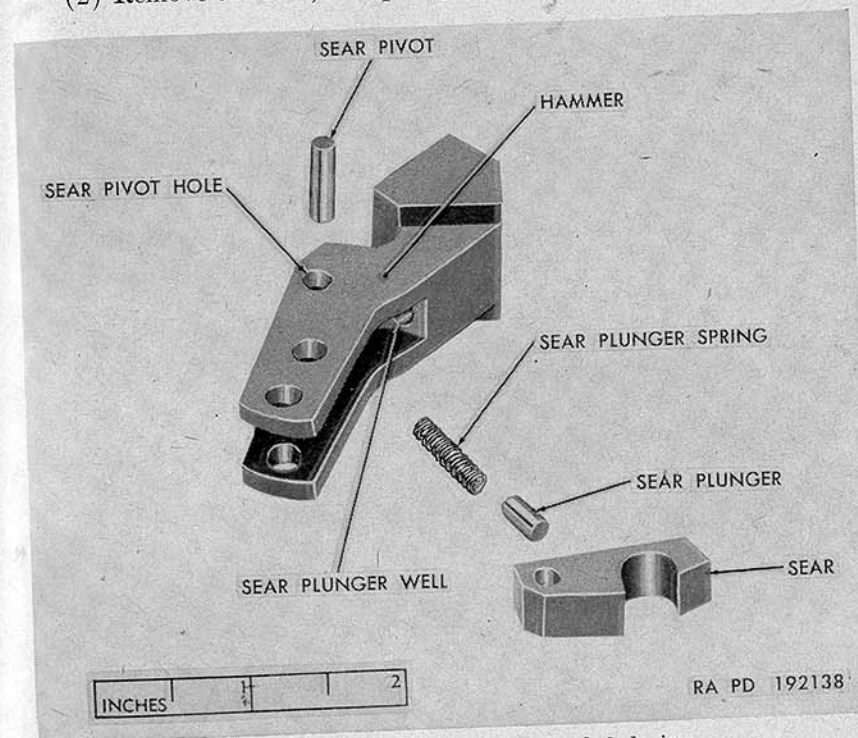


Figure 98. Hammer assembly—exploded view.

c. *Disassembly of Cylinder Assembly* (fig. 99).

- (1) Use a drift and tap out the cylinder shaft out the rearward end of the cylinder.
- (2) Remove cylinder spindle spring.
- (3) Remove ratchet body from cylinder shaft.
- (4) Remove ratchet key from ratchet body.

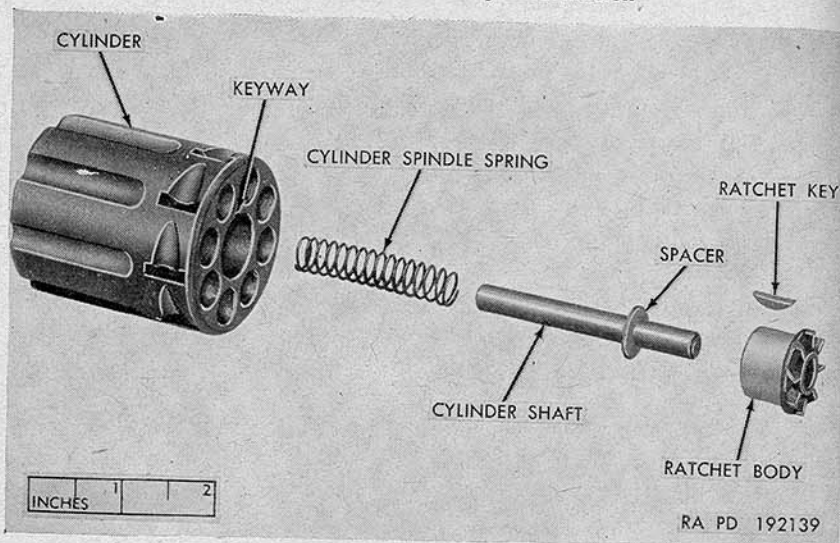


Figure 99. Cylinder assembly—exploded view.

d. Disassembly of Charger Housing Group (figs. 100 and 101).

- (1) Remove the end plate lock pin by inserting small screw driver under pin and prying upward.

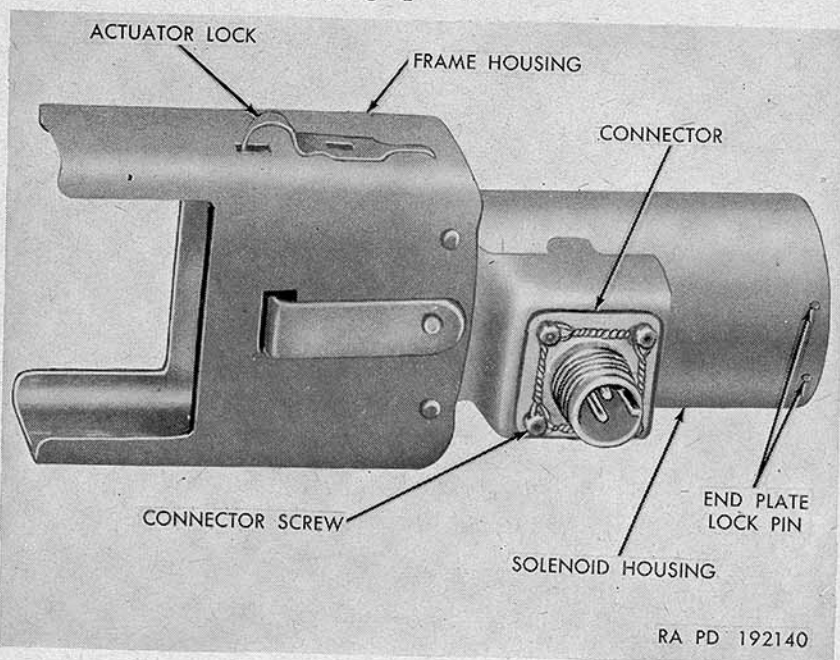


Figure 100. Charger housing group.

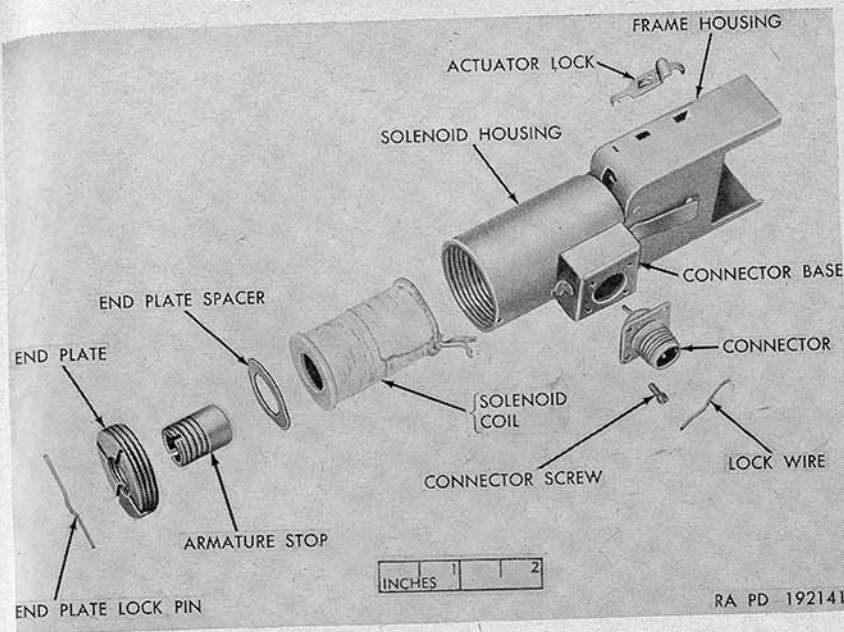


Figure 101. Charger housing group—exploded view.

- (2) Unscrew the end plate.
- (3) Unscrew and remove the armature stop from the end plate.
- (4) Break the lockwire and unscrew the four connector screws.
- (5) Pull connector out to expose wires which lead to solenoid. Do not break wire too far from connector or soldering will be difficult.
- (6) Withdraw end plate spacer and solenoid coil.
- (7) Insert screw driver under small end of actuator lock. Slide lock forward and remove.

140. Inspection

- a. Refer to paragraph 90 for the inspection performed by organizational maintenance personnel.
- b. Inspect solenoid coil for oil, dirt, and deterioration of the insulator covering.
- c. Check all pivot pins for wear.
- d. Inspect all moving parts for rust, and be sure they are lightly oiled.
- e. Inspect face of hammer, firing pin, and chamber in cylinder for powder fouling.
- f. Inspect teeth of ratchet body for cracks.

141. Repair

Repair of the charger consists of replacing parts when inspection indicates replacement is necessary.

142. Assembly

a. Assembly of Frame Group.

- (1) Insert sear from top of frame extension (fig. 97) and screw into place, approximately flush with top of extension.
- (2) Install firing pin spring in lower hole of frame, then firing pin.
- (3) Depress firing pin and slide in firing pin retainer (fig. 97).
- (4) Install spindle extension so that the angled flat faces upward.
- (5) Insert the straight portion of the pawl spring into the small pin hole of the index pawl (fig. 102).

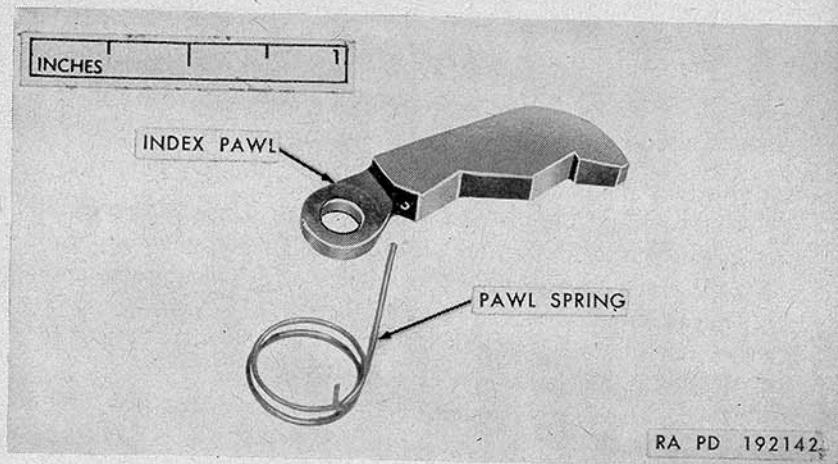


Figure 102. Installation of pawl spring in index pawl.

- (6) Install the index pawl and spring on the pawl pivot of the actuator assembly (fig. 103). Position hook end of pawl spring under the index pawl liner. This will cause the pawl spring to rotate the index pawl. The index pawl will have to be held so that it is pointing forward for the rest of the assembly operation.
- (7) Slide the index pawl, with actuator assembly and spring, into the slot on the right-hand side of the frame. The pawl must be inserted below the pawl cam.
- (8) Align hammer pivot hole of index pawl lever with that in the frame extension.

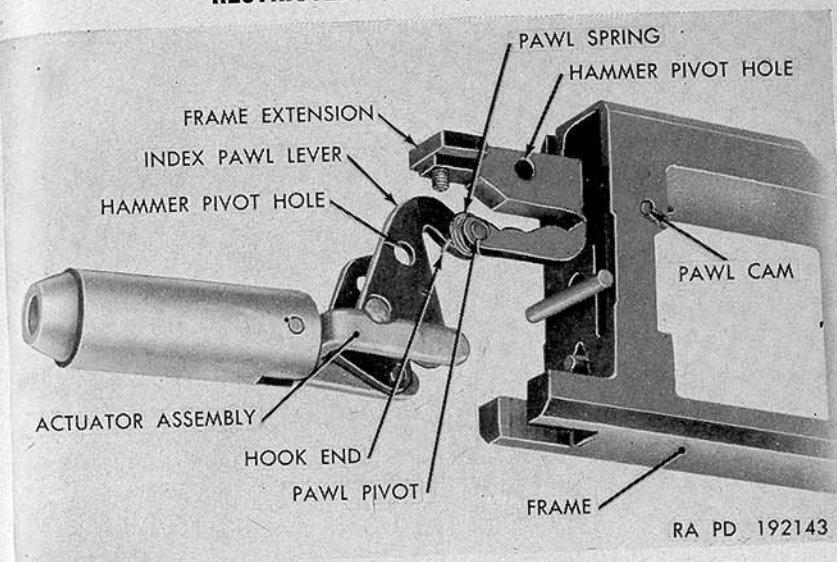


Figure 103. Installation of index pawl and actuator assembly.

b. Assembly of Hammer Assembly.

- (1) Insert sear plunger spring and sear plunger in the sear plunger well.
- (2) Depress the sear plunger and spring with the sear. Be sure hook side of sear faces away from hammer face.
- (3) Align the hole in the sear with the sear pivot hole of the hammer and install the sear pivot.
- (4) Align hammer pivot hole (fig. 104) of hammer assembly with those of the index pawl liner assembly by sliding the hammer between the index pawl lever and the frame extension.
- (5) Align hammer pivot holes of lock latch with those of the hammer assembly, extension, and levers. Drift in hammer pivot.
- (6) Lift the lock latch (fig. 96) so that the leaf springs will allow sufficient clearance for installation of hammer plunger and spring.
- (7) Slide hammer plunger spring beneath lock latch into the deep hole in the frame. Insert hammer plunger in the same manner.
- (8) Depress hammer plunger and maintain the pressure against the spring and install the hammer spring plunger pivot.
- (9) Release plunger and be sure the groove in the plunger head rests in the notch of the hammer spring plunger pivot (fig. 96).

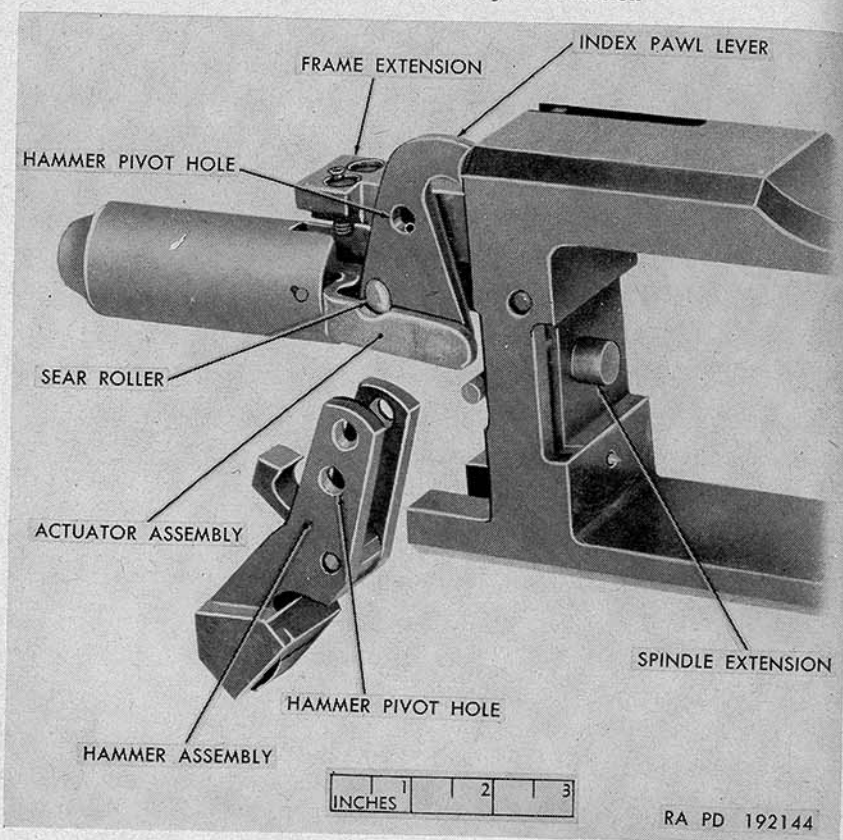


Figure 104. Installation of hammer assembly on frame.

- (10) Install armature spring in armature (fig. 96).

Note. After assembly of frame group, the point of sear release can be adjusted by means of the sear stop. To release sooner, screw sear stop downward (out of extension). To release later, screw sear stop into frame extension.

c. Assembly of Charger Housing Group (figs. 100 and 101).

- (1) Insert solenoid coil into solenoid housing and pull wire leads through the connector hole. Resolder leads to connector.
- (2) Position connector so that the four screw holes align with those in the connector base. Install and lock-wire the four connector screws.
- (3) Install end plate spacer over coil.
- (4) Install armature stop in end plate and screw both into rear of solenoid housing as far as possible.

- (5) Turn end plate back until one of the slots in the end plate aligns with one of the pin holes of the solenoid housing.
- (6) Install end plate lock pin in slot of end plate and allow pin to pass through pin holes of solenoid housing. Rotate pin and snap into groove of armature stop.
- (7) Install the actuator lock.

Note. Provision has been made for installing the actuator lock on either top or bottom of the frame housing. By inverting the housing, the side on which the connector is assembled can be changed, thus providing for either left-hand or right-hand charging.

d. Assembly of Cylinder Assembly (fig. 99).

- (1) Install ratchet body on short end of cylinder shaft, closest to spacer.
- (2) Insert ratchet key in ratchet body.
- (3) Install cylinder spindle spring into cylinder from rear.
- (4) Insert cylinder shaft, with ratchet, into rear of cylinder. Align ratchet key with keyway in cylinder. Press into position until flange on ratchet body contacts rear face of cylinder.

e. Assembly of Groups. Refer to paragraph 91 for complete assembly of charger.

143. Installation

Refer to paragraph 92 for the installation of the percussion charger T13.

Section XII. FINAL INSPECTION

144. General

The acceptance standard of a weapon for service, that has undergone repairs at a field maintenance shop, is its ability to perform its cyclic operation (par. 37 to 47) with a smooth mechanical action. It will be necessary therefore, for the responsible field maintenance personnel in the field maintenance shop to test the weapon by observing the functioning of its moving parts and to fire the weapon and check its performance under fire.

145. Function Testing

- a.* Place the gun in a suitable fixture and fasten it securely. Have the gun properly lubricated.
- b.* Remove the operating springs (par. 62) and the feeder assembly (par. 56).

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c. Using the hand or rammer hook (fig. 27), retract the operating slide. Observe drum rotation, it should not start until after the operating slide has left battery and should stop just before the slide returns.

d. Remove the extractor spring screw (par. 73e) and check the action of the extractor during hand cycling. The action should be positive even without the extractor spring. Reinstall extractor spring screw.

e. Insert dummy rounds, into the chamber in front of the upper ramming face of the rammer (par. 43b). Cycle the round through the four drum stations. As the rounds are brought up to the fourth station, observe the action. The pawl of the antidouble feed should be lifted sufficiently to disengage the contacts. The case must be gripped, by the extractor, in the groove around its base and pulled from the chamber. The speed at which it leaves the chamber will depend upon the speed at which the slide is hand cycled.

f. Replace operating springs (par. 64). Connect electrical connector (fig. 13) to a 24-volt direct-current source. Load the charger cylinder with cal. .30 carbine grenade cartridges and install on the charger. Be sure the charger gas tube is connected to the charger and the charger cylinder. Fire one cartridge and check the operating slide's cycle. It must be all the way into battery when the cycle is complete.

g. Install the feeder (par. 60) and make up a belt of three dummy rounds (par. 18). Install belt in feeder (par. 19b) and charge the gun three times (par. 19b). Each time the gun is charged, the rammer should strip one round from the belt and chamber it in the drum (par. 3b). Charge the gun three times more, and check the extraction of the rounds.

Caution: The area behind the ejection chute of the feeder must be kept clear due to the velocity of the extracted cases (60 fps).

146. Function Firing

a. In order to fire this weapon, a sufficiently sturdy stand must be available to mount the gun. Fasten the receiver to the stand in four places. Position the stand and gun so as to have the projectile hit in a pit or bank.

b. Be sure area behind the gun is clear or attach adapter chute from the case ejection chute to a disposal point to take care of the empty cartridge cases.

c. Connect a 200-volt source to the firing circuit connector (par. 38b).

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d. Load the gun with a belt of live rounds and charge three times (be sure current is not on).

e. Stand clear of case ejection chute and fire weapon.

f. If gun fails to fire, clear weapon and check electric circuit (par. 127).

CHAPTER 5 AMMUNITION

147. General

a. This chapter contains information pertaining to the several types of cartridges authorized for use in GUN, automatic, cal. .60, T130, and the several types of cartridges authorized for use in GUN, automatic, 20-mm, T160. Inasmuch as the ammunition used in these guns differs, separate data applicable to the ammunition used in each gun are given. In those paragraphs wherein no provisions are made for differences in ammunition used in these guns, the information is general in nature and is equally applicable to the ammunition used in either gun.

b. The ammunition for the cal. .60 automatic gun T130 is classified as small-arms ammunition and is issued in the form of a complete round. A complete round (cartridge) consists of all the components necessary to fire the weapon once, that is, projectile (bullet), cartridge case, propellant powder, and electric primer.

c. The ammunition for the 20-mm automatic gun T160 is classified as artillery ammunition and is issued in the form of a complete round of "fixed" ammunition. The term "fixed," used in conjunction with ammunition, signifies that the propelling charge is fixed (not adjustable) and that the round is loaded into the weapon as a unit. A complete round (cartridge) consists of all the components necessary to fire the weapon once, that is, projectile, cartridge case, propellant powder, and electric primer.

148. Firing Tables

Firing tables for these automatic guns, when available, will be indexed in SR 310-20-3.

149. Classification

Based upon type of projectile with which rounds are assembled, and use thereof, ammunition for these automatic guns is classified as follows:

a. *For the Cal. .60 Automatic Gun T130.*

- (1) Armor-piercing-incendiary cartridge, for use against armored aircraft, lightly armored vehicles, and other bullet

resisting targets where armor-piercing and incendiary effects are desired.

- (2) Ball cartridge, for use against light matériel targets and personnel.
- (3) Incendiary cartridge, for use against flammable targets, especially fuel and oil systems on aircraft.

b. *For the 20-mm Automatic Gun T160.*

- (1) Armor-piercing-incendiary cartridge, for use against armored aircraft, lightly armored vehicles, and other bullet resisting targets where armor-piercing and incendiary effects are desired.
- (2) High-explosive-incendiary cartridge, for use against light matériel target where functioning with explosive and incendiary effects are desired.
- (3) Target practice cartridge, for practice firing.
- (4) Drill (dummy) cartridge is completely inert and is intended only for practice in loading and handling.

150. Identification

Ammunition used in these guns is completely identified by the painting and markings thereon in accordance with the following:

a. *For the cal. .60 Automatic Gun T130.*

- (1) *General.* The marking, including an ammunition lot number, on all original packing containers (both boxes and cartons), clearly and fully identifies the ammunition *except* as to grade. For grades see (3) below. The ammunition lot number, including its importance is described in c(2) below. The significance of the AIC symbol as part of the marking is explained in c(3) below. The cartridges themselves are marked and stamped as follows:
 - (a) The manufacture's initials or symbol and the year of loading are stamped on the base of the cartridge case.
 - (b) The cartridge is marked with the ammunition lot number.
 - (c) The distinguishing characteristics of the several types and models of cartridges are described in (2) below.
- (2) *Types.* When removed from their original packing containers, the cartridges may be identified by physical characteristics described below.

Type	Distinguishing Characteristics
Armor-piercing-incendiary---	Tip of bullet painted aluminum color.
Ball-----	Copper-coated gilding metal jacket on bullet (no markings).
Incendiary-----	Tip of bullet painted blue.

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(3) *Grades.* Small-arms ammunition is graded primarily on the qualities which make the lot especially suited for use in a particular class of weapons; for example, a lot of ammunition assigned grade AC is especially suited for use in aircraft weapons. Current grades of all existing lots of small-arms ammunition are established by the Chief of Ordnance and are published in Department of the Army Technical Bulletin 9-AMM 4. Only those lots of appropriate grade will be fired. Grade 3 indicates unserviceable ammunition which will not be issued or fired or cartridges for which the ammunition lot number has been lost. However, ammunition placed in grade 3 due to loss of ammunition lot number, but which can be identified as having been in serviceable lots issued to a specific organization, may be reissued after visual inspection, but only for local training purposes in ground machine guns. When cartridges are removed from original packings they should be marked or tagged so that the ammunition lot number may be preserved.

b. For the 20-mm Automatic Gun T160.

(1) *General.* Ammunition and ammunition components are completely identified by the painting and marking, including an ammunition lot number, which appears on all original packing containers and, when practicable, on the items themselves. The distinguishing characteristics of the several types of cartridges are described in (2) below. The markings which appear on the components of the cartridges are described in (3) below.

(2) *Types.* Artillery projectiles are painted primarily to prevent rust and to provide, by the color, a means of identification as to type. Lusterless paint is used to meet the requirements for camouflage. The color scheme for the various types of projectiles is as follows:

Type	Distinguishing Characteristics
Armor-piercing-incendiary ---	Cartridge identification is stenciled in white.
High-explosive-incendiary ----	Cartridge identification is stenciled in black.
Target practice-----	Black body; cartridge identification is stenciled in white.
Drill (dummy)-----	Black body; cartridge identification is stamped on the cartridge.

(3) *Marking.* In addition to the ammunition lot number, which is marked on every cartridge, the components of each round

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of artillery ammunition described herein are marked as indicated in (a) through (c) below.

(a) *On projectile (stenciled).*

1. Caliber and type of cartridge.
2. Model of cartridge.
3. Loader's initials.

(b) *On projectile (stamped in rotating band or in the body).*

1. Projectile lot number.
2. Year of manufacture.
3. Manufacturer's initials or symbol.
4. Caliber and model designation.

(c) *On head of cartridge case (stamped unless otherwise indicated).*

1. Manufacturer's initials or symbol.
2. Year of manufacture.

(d) *On fuze (stamped in metal).*

1. Model and designation of fuze.
2. Manufacturer's initials or symbol.
3. Loader's lot number.
4. Month and year of loading.

c. For the cal. .60 and 20-mm automatic guns.

(1) *Model.* To identify a particular design, a model designation is assigned at the time the item is classified as an adopted type. This model designation becomes an essential part of the standard nomenclature and is included in the marking on the item. The present system of model designation consists of the letter "M" followed by an Arabic numeral, for example, "M1." Modifications are indicated by adding the letter "A" and appropriate Arabic numeral. Thus, "M1A3" indicates the third modification of an item for which the original designation was "M1." Similarly, a system applied to development items involves the use of a "T" designation to indicate the basic design and an "E" to indicate modifications thereof. Thus, "T1E1" would indicate the first modification of a development item originally designated "T1."

(2) *Ammunition lot number.* When ammunition is manufactured, an ammunition lot number, which becomes an essential part of the marking, is assigned in accordance with pertinent specifications. This lot number is marked on all packing containers of cal. .60 and 20-mm ammunition. Since it is impracticable to mark the ammunition lot number on each cartridge, every effort should be made to maintain the

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ammunition lot number of cartridges removed from their original packings. In any one lot of ammunition, the components used in the assembly of the lot are manufactured under as nearly identical conditions as practicable. To obtain the greatest accuracy when firing, successive cartridge belts should consist of cartridges of one ammunition lot number.

- (3) *AIC (ammunition identification code) symbol.* The AIC symbol indicates a specific cartridge having a specific packing. In the case of cal. .60 ammunition, the AIC symbol may also indicate a specific grade (*a* (3) above) of ammunition or a combination of types of cartridges. AIC symbols for cal. .60 and 20-mm ammunition are published in the Department of the Army Supply Catalogs ORD 3 SNL's T-1 and R-1, respectively.

151. Care, Handling, and Preservation

Note. Explosive ammunition must be handled with care at all times. The explosive elements in primers and fuzes are particularly sensitive to undue shock and high temperature. Electric primers are sensitive to electrical energy; care should be exercised to prevent the ammunition from coming in contact with electrical wiring or other sources of electricity. Boxes containing ammunition should not be dropped, thrown, tumbled, or dragged.

a. Ammunition for the cal. .60 gun, compared with 20-mm (with explosive projectile) ammunition, is not as dangerous to handle.

b. Ammunition is packed to withstand conditions ordinarily encountered in the field. Care must be observed to keep packings from becoming broken or damaged. All broken packings must be repaired immediately and careful attention given to the transfer of all markings to the new parts. The ammunition may be packed in metal-lined wooden boxes or metal boxes. If the damaged box contains a metal liner, it should be air-tested and sealed providing that equipment for this work is available.

c. When it is necessary to leave ammunition in the open, raise it on dunnage at least 6 inches from the ground and cover it with a double thickness of paulin, leaving enough space for the circulation of air. Where practicable, dunnage strips should be placed under each layer of boxes. Suitable trenches should be dug to prevent water from running under the pile.

d. Since ammunition and explosives are adversely affected by moisture and high temperature, due consideration should be given to the following:

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- (1) Do not open boxes until ammunition is to be used. Ammunition removed from airtight containers, particularly in damp climates, is apt to corrode, thereby rendering the ammunition unserviceable.

- (2) Protect ammunition from high temperature and direct rays of the sun. More uniform firing is obtained if the rounds are at the same temperature. The combination of high temperatures and a humid atmosphere is particularly detrimental to the stability of the propellant powder and tracer mixtures in tracer ammunition.

e. Do not attempt to disassemble the complete round or any of its components.

f. The use of oil or grease on cartridges is prohibited.

g. Ammunition should be protected from sand, mud, moisture, frost, snow, ice, grease, or other foreign matter. If it gets wet or dirty, it should be wiped off at once. If verdigris or light corrosion forms on the cartridges, it should be wiped off with a clean dry cloth. However, cartridges should not be polished to make them look better or brighter.

h. Brass cartridge cases are easily dented and should be protected from hard knocks or blows. Dented cartridge cases may cause incomplete obturation, jamming in the chamber, and difficulty in extraction.

i. Ammunition, when stored, should be segregated by caliber, type, and lot (refer to TM 9-1900).

j. When only a part of a box of ammunition is used, the ammunition remaining in the box should be protected against unauthorized handling and use by firmly fastening the box cover in place.

k. Do not handle duds. Duds are extremely dangerous because their fuzes may be armed. They will not be moved or touched but will be destroyed in place in accordance with TM 9-1900.

152. Authorized Rounds

The table of authorized rounds (table VII) is given in two parts; the first part consists of cartridges authorized for use in the cal. .60 automatic gun T130; the second part consists of cartridges authorized for use in the 20-mm automatic gun T160. CARTRIDGE, grenade, carbine, cal. .30, M6 is used in the percussion charger T13. The cartridge is listed in part I and part II of this table. The same link (T61E2), which is also authorized for separate issue, is used when assembling belts of cal. .60 or 20-mm ammunition. The link is listed in part I and part II of this table.

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Table VII. Authorized Rounds

PART I. AUTHORIZED ROUNDS FOR THE CAL. .60 GUN T130

Standard nomenclature	Length of complete round (in)	Projectile weight as fired (lb)
CARTRIDGE, API, cal. .60, T82E2 (w/electric primer M52A3)	6.62	0.16
CARTRIDGE, ball, cal. .60, T80 (w/electric primer M52A3)	6.62	0.16
CARTRIDGE, incendiary, cal. .60, T81E1 (w/electric primer M52A3)	6.62	0.16
CARTRIDGE, grenade, carbine, cal. .30, M6 (used in percussion charger T13)	1.68	
LINK, metallic belt, T61E2		

PART II. AUTHORIZED ROUNDS FOR THE 20-MM GUN T160

CARTRIDGE, API, T151, for 20-mm gun T160 (w/electric primer M52A3)	6.615	0.23
CARTRIDGE, HEI, T149, w/fuse, PD, T200E13, for 20-mm gun T160 (w/electric primer M52A3)	6.615	0.23
CARTRIDGE, TP, T154, for 20-mm gun T160 (w/electric primer M52A3)	6.615	0.23
CARTRIDGE, drill (dummy), T152, for 20-mm gun T160	6.615	1 0.23
CARTRIDGE, grenade, carbine, cal. .30, M6 (used in percussion charger T13)	1.68	
LINK, metallic belt, T61E2		

¹ Cartridge is not fired.

API—armor-piercing incendiary.
HEI—high explosive incendiary.
M—model.

TP—target practice.
w/—with.

153. Preparation for Firing

a. Preparation of Cartridge. After removal from packing materials, linked cartridges for these automatic guns are ready for firing. Carton packed cartridges for these automatic guns are also ready for firing upon removal from packing materials except that they must be loaded into link belts as described in paragraph 18. Cartridges prepared for firing but not fired will be returned to their original condition and packings or will be packed, as belted, in suitable packing boxes. The packing boxes should be appropriately marked to indicate the nomenclature of the cartridges, the quantity of cartridges therein, and the appropriate ammunition lot number. Such rounds

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will be used first in subsequent firings in order that stocks of opened packings may be kept at a minimum.

b. Preparation of CARTRIDGE, Grenade, Carbine, cal. .30, M6 for Use in Percussion Charger T13. After removal from packing materials, the carbine grenade cartridges, used in the charger T13, are ready for firing except that they must be loaded into the percussion charger as described in paragraph 17.

154. Fuzes

a. General. A fuze is a device used with a projectile to explode it at the time and under the circumstances desired. The fuze used with the high-explosive-incendiary projectile is assembled to the cartridge as issued. Cal. .60 projectiles are similar in construction to other small-arms projectiles and do not require a fuze for proper functioning.

b. Boresafe Fuze. A boresafe (detonator-safe) fuze is one in which the explosive train is so interrupted that, while the projectile is still in the bore of the weapon, premature action of the bursting charge is prevented should any of the more sensitive elements (primer or detonator) function. The fuze used with the ammunition described herein is considered boresafe.

Caution: Fuzes will not be disassembled. Any attempt to disassemble fuzes in the field is dangerous and is prohibited except under specific directions from the Chief of Ordnance.

c. FUZE, PD, T200E13.

(1) *Description.* The FUZE, PD, T200E13 is a single-action impact type which functions with superquick action on impact with the target. The fuze mechanism incorporates a spherical rotor-type interrupter and a rotor safety spring. The safety spring provides boresafety by preventing the rotor from turning and prevents the firing pin from coming into contact with the rotor.

(2) *Setting.* This fuze requires no setting.

155. Precautions in Firing

The following precautions should be closely observed in order to prevent injury to personnel or damage to matériel:

a. Before loading into links, the ammunition should be free of sand, mud, moisture, frost, snow, ice, grease, or other foreign matter. The loaded links should likewise be free of foreign matter before being fed into the weapon.

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- b. Ammunition which is seriously corroded should not be fired.
- c. Brass cartridge cases are easily dented and should be protected from hard knocks and blows. Dented cartridge cases may cause incomplete obturation, jamming in the chamber, and difficulty in extraction.
- d. Cartridges which have been seriously damaged, or those having loose bullets, should not be used.
- e. Ammunition should not be fired unless it has been identified by ammunition lot number. In the case of cal. .60 ammunition, the grade as published in Department of the Army Technical Bulletin TB 9-AMM 4, must also be known.
- f. Do not fire cartridges which have become overheated due to exposure to the direct rays of the sun or other sources of high temperature. Such cartridges, if fired, may develop hazardous chamber pressures.
- g. Misfires and hangfires will be handled as indicated in SR 385-310-1.

156. Packing and Marking

a. Packing.

- (1) The individual cartridges for the cal. .60 and 20-mm automatic guns are packed in cartons or chipboard tubes or in linked belts. Linked belts contain 28 or 50 cartridges. The cartridges are then packed into metal boxes or metal cans in wooden boxes. Complete data will be published in Department of the Army Supply Catalogs ORD 3 SNL's R-1 and T-1.
- (2) The CARTRIDGE, grenade, carbine, cal. .30, M6 is packed in paper cartons. The cartons are packed in waterproof envelopes or metal cans and are then placed in wooden packing boxes. Complete data are published in Department of the Army Supply Catalog ORD 3 SNL S-4.
- (3) The metallic links are packed in paper cartons. The links are then packed in wooden boxes or wirebound crates. Complete data will be published in Department of the Army Supply Catalogs ORD 3 SNL's R-1 and T-5.

b. Marking.

- (1) The following information is marked on packing boxes of cal. .60 and 20-mm ammunition for these automatic guns:
 - (a) Interstate Commerce Commission (ICC) shipping designation.

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- (b) Ammunition Identification Code (AIC) symbol.
 - (c) Ammunition lot number.
 - (d) Gross weight of packing and contents.
 - (e) Cubical displacement of packing box.
 - (f) Descriptive nomenclature of packed item.
 - (g) Caliber and weapon designation.
 - (h) Ordnance insignia.
 - (i) Name and address of box manufacturer and date manufactured.
 - (j) Inspector's stamp.
- (2) The following information is marked on packing boxes of cal. .30 carbine grenade cartridges:
 - (a) Interstate Commerce Commission (ICC) shipping designation.
 - (b) Ammunition Identification Code (AIC) symbol.
 - (c) Ammunition lot number.
 - (d) Gross weight of packing and contents.
 - (e) Cubical displacement of packing box.
 - (f) Descriptive nomenclature of packed item.
 - (g) Caliber and weapon designation.
 - (h) Ordnance insignia.
 - (i) Name and address of box manufacturer and date manufactured.
 - (j) Inspector's stamp.
 - (3) The following information is marked on packing boxes of metallic links:
 - (a) Ammunition Identification Code (AIC) symbol.
 - (b) Lot number.
 - (c) Gross weight of packing and contents.
 - (d) Cubical displacement of packing box.
 - (e) Descriptive nomenclature of packed item.
 - (f) Caliber and weapon designation.
 - (g) Ordnance insignia.
 - (h) Name and address of box manufacturer and date manufactured.
 - (i) Inspector's stamp.
 - (j) The letters U. S.

CHAPTER 6

SHIPMENT AND LIMITED STORAGE AND DESTRUCTION
OF MATERIEL TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

157. Domestic Shipping Instructions

a. Preparation for Shipment in Zone of Interior. When shipping the 20-mm automatic gun T160 and cal. .60 automatic gun T130 interstate or within the zone of interior, the officer in charge of preparing the shipment *will be responsible* for furnishing weapons to the carriers for transport in a *serviceable* condition, properly cleaned, preserved, packaged, and packed.

b. Preparation for Shipment to Ports.

(1) *Inspection.* All used weapons destined for oversea use will be inspected prior to shipment in accordance with TB ORD 385.

(2) *Preparation for Shipment to Ports.* Prepare all weapons destined to ports of embarkation for oversea shipment in the same manner as prescribed for domestic shipment.

c. Army Shipping Documents. Prepare all Army shipping documents accompanying freight in accordance with TM 38-705.

158. Limited Storage Instructions

a. Receiving Inspections.

(1) Report all weapons received for storage in a damaged condition or improperly prepared for shipment on DD Form 6, in accordance with SR 745-45-5. Report of weapons received in an unsatisfactory condition (chronic failure or malfunction of the weapon or equipment) will be reported on AF Form 54, Unsatisfactory Report, in accordance with SR 700-45-5.

(2) Perform a systematic inspection and replace or repair all missing or broken parts. If repairs are beyond the scope of the unit, causing the weapons to be out of service for an appreciable length of time, store them in a limited-storage status and attach a tag to them specifying the repairs needed.

The report of these conditions will be submitted by the unit commander for action by an ordnance maintenance unit.

b. Inspections During Storage. Perform a visual inspection periodically to determine general condition as prescribed in (1) through (3) below. If corrosion is found on any part, remove the rust spots, clean, and treat with the prescribed preservatives.

Note. Aircraft machine guns that are packed "Method II" must not be removed from pack for percentage inspection. Specific instructions will be issued to conduct percentage inspection on machine guns in this pack. However, boxes should be opened and an inspection made of the "Method II" pack. If pack is damaged or broken, weapon will be removed and processed, and packaged and packed as prescribed.

- (1) Inspect at least 1 percent of weapons in storage annually. If results of the 1-percent inspection reveal defective units, then inspect 10 percent of the weapons. If additional defective weapons are discovered, inspect the entire lot.
- (2) When a 1-percent or 10-percent inspection proves satisfactory, select weapons not previously inspected for the next annual inspection.
- (3) Inspectors must carefully examine selected weapons for packaging, observing condition of containers, legibility and *accuracy* of package markings, and method of packaging.

c. Storage Site.

- (1) Personnel must carefully examine the storage location to determine whether it is adequate for the weapons involved.
- (2) Store all 20-mm automatic guns T160 and cal. .60 automatic guns T130 in a cool, indoor, dry, controlled-temperature location, whenever possible. Where it is found necessary to store weapons outdoors, cover and protect them against the elements as prescribed in TB ORD 379.

d. Removal From Limited Storage.

- (1) If the weapons are not shipped or issued upon expiration of the 90-day limited-storage period, they must be further inspected as prescribed in *b* above.
- (2) If the weapons to be shipped will reach their destination within the scope of the limited-storage period, they need not be processed upon removal from storage unless inspection reveals it to be necessary according to anticipated in-transit weather conditions.

Note. All weapons being reissued through the depot supply system to troops within the continental limits of the United States must meet the requirements of TB ORD 385. This is NOT required for so-called reissues, exchanges, or redistribution among troop units, where the depot supply system is not involved.

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- (3) Service weapons in accordance with chapter 2, section I, when it has been ascertained that they are to be placed into immediate service. Lubricate as prescribed in chapter 3, section II.
- (4) Repair and/or replace all weapons tagged in accordance with a (2) above.

Section II. DESTRUCTION OF MATÉRIEL TO PREVENT ENEMY USE

159. General

a. Destruction of the 20-mm automatic gun T160 or cal. .60 automatic gun T130, when subject to capture or abandonment in the combat zone, will be undertaken by the using arm only when, in the judgment of the unit commander concerned, such action is necessary in accordance with orders of, or policy established by, the army commander. When these guns are in the possession of ordnance maintenance personnel, or in storage, destruction will be in accordance with FM 9-5, and applicable portions of the information below.

b. The information which follows is for guidance only. Certain of the procedures outlined require the use of explosives and incendiary grenades which normally may not be authorized items for the airplane. The issue of these and related materials, and the conditions under which destruction will be effected, are command decisions in each case, according to the tactical situation. Of the several means of destruction, those most generally applicable are:

Mechanical-----	Requires axe, pick mattock, sledge, crowbar, or similar implement.
Burning-----	Requires gasoline, oil, incendiary grenades, or other flammables.
Demolition-----	Requires suitable explosives or ammunition.
*Gunfire-----	Includes artillery, machine guns, rifles using rifle grenades, and launchers using antitank rockets. Under some circumstances hand grenades may be used.

In general, destruction of essential parts by mechanical means will usually be sufficient to render the automatic gun useless. However, selection of the particular method of destruction requires imagination and resourcefulness in the utilization of the facilities at hand under the existing conditions. Time is usually critical.

*Generally applicable only when the automatic gun is to be destroyed in conjunction with other matériel.

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c. If destruction to prevent enemy use is resorted to, the automatic gun must be so badly damaged that it cannot be restored to a usable condition in the combat zone either by repair or cannibalization. Adequate destruction requires that all parts essential to the operation of the machine gun, including essential spare parts, be destroyed or damaged beyond repair. However, when lack of time and personnel prevents destruction of all parts, priority is given to the destruction of those parts most difficult to replace. Equally important, the same essential parts must be destroyed on all like matériel so that the enemy cannot construct one complete unit from several damaged ones.

d. If destruction by demolition or gunfire is directed, due consideration should be given to the observance of appropriate safety precautions.

160. Destruction of the Automatic Gun

a. *General.* If time, personnel, and materials are available, the destruction of the armament should be accomplished in conjunction with the destruction of the airplane by incendiary means. However, if it is inadvisable to destroy the airplane by fire, or if the armament is to be destroyed separately from the airplane, the armament should be removed from their mountings and be destroyed by one of the methods outlined below.

Note. Prior to removing the automatic gun, all ammunition should be removed from the weapon.

b. *Method No. 1—By Smashing.* Using an axe, pick mattock, sledge, or other heavy implement, smash the feeder mechanism, drum and drum rollers, charger mechanism, barrel latch, charger gas lines, electrical connectors, receiver, end plate, mounting lugs and mounting hole threads. Elapsed time: about 2 minutes.

c. *Method No. 2—By Demolition.*

- (1) Place the automatic gun on the ground.
- (2) Prepare a 1-pound charge of EXPLOSIVE, TNT (using 1-lb blocks or equivalent together with the necessary detonating cord) and place the charge on the receiver.
- (3) For priming, either a nonelectric blasting cap crimped to at least 5 feet of safety fuse (safety fuse burns at the rate of 1 ft in 30 to 45 sec; test before using), or an electric blasting cap and firing wire may be used. Safety fuse, which contains black powder, and nonelectric blasting caps must be protected from moisture at all times. The safety fuse may be

ignited by a fuse lighter or a match; the electric blasting cap requires a blasting machine or equivalent source of electricity.

Caution: Keep the blasting caps, detonating cord, and safety fuse separated from the charges until required for use.

Note. For the successful execution of methods of destruction involving the use of demolition materials, all personnel concerned will be thoroughly familiar with the pertinent provisions of FM 5-25. Training and careful planning are essential.

d. Method No. 3—By Burning (Incendiary Grenades).

- (1) Place the automatic gun on the ground; lay the gun on its left side (cartridge case chute up).
- (2) Place an incendiary grenade on the feeder frame.
- (3) Fire the grenade. Elapsed time: about 1 minute.

e. Destruction of Ammunition. For destruction of ammunition, refer to TM 9-1901.

APPENDIX

REFERENCES

1. Publication Indexes

Special Regulations in the 310-20 series, SR 110-1-1, ORD 1, and FM 21-8.

Ordnance Major Items and Combinations and Pertinent Publications-----SB 9-1

2. Supply Catalogs

The following catalogs of the Department of the Army Supply Catalog pertain to this matériel:

a. Ammunition.

Ammunition, Fixed and Semifixed, Including ORD 3 SNL R-1
Subcaliber, for Pack, Light and Medium
Field, Aircraft, Tank, and Antitank Artillery, Including Complete Round Data.

Ammunition Instruction Material for Pack, ORD 3 SNL R-6
Light and Medium Field, Aircraft, Tank,
and Antitank Artillery.

Ammunition, Rifle, Carbine, and Automatic ORD 3 SNL T-1
Gun.

Shipping and Packaging Containers and Ma- ORD 3 SNL T-5
terials, Including Such Items as Bando-
leers, Belts, Clips, Links, and Ends for
Small-Arms Ammunition.

b. Destruction to Prevent Enemy Use.

Land Mines and Components; Demolition Ex- ORD 3 SNL R-7
plosives and Related Items; and Ammuni-
tion for Simulated Artillery, Booby Trap,
Hand Grenade, and Land Mine Fire.

c. Maintenance and Repair.

Cleaners, Preservatives, Lubricants, Recoil ORD 3 SNL K-1
Fluids, Special Oils, and Related Mainte-
nance Materials.

Special Tool Sets for Small Arms and Auto- ORD 6 SNL J-12
matic Weapons (SNL Groups A and B).

Tool Set, Armorers'----- ORD 6 SNL J-10
Section 1

3. Forms

The following forms are applicable to this matériel:

- AF Form 54 Unsatisfactory Report
- AF Form 185 Maintenance and Performance Record
- DD Form 6 Report of Damaged or Improper Shipment

4. Other Publications

The following publications contain information pertinent to this matériel and associated equipment:

a. Ammunition.

- Ammunition, General----- TM 9-1900
- Ammunition Inspection Guide----- TM 9-1904
- Artillery Ammunition----- TM 9-1901
- Ballistic Data, Performance of Ammunition----- TM 9-1907
- Qualifications in Arms and Ammunition Training Allowances----- AR 775-10
- Regulations for Firing Ammunition for Training, Target Practice, and Combat----- SR 385-310-1
- Small-Arms Ammunition----- TM 9-1990
- Training Ammunition----- T/A 23-100

b. Destruction to Prevent Enemy Use.

- Explosives and Demolitions----- FM 5-25
- Ordnance Service in the Field----- FM 9-5

c. General.

- Supplies and Equipment: General—Unsatisfactory Equipment Report----- SR 700-45-5

d. Shipment and Limited Storage.

- Army Shipping Document----- TM 38-705
- Protection of Ordnance General Supplies in Open Storage----- TB ORD 379
- Shipment of Supplies and Equipment: Report of Damaged or Improper Shipment----- SR 745-45-5
- Standards for Oversea Shipment and Domestic Issue of Ordnance Matériel Other Than Ammunition and Army Aircraft----- TB ORD 385

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